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ABSTRACT

A series of methods and techniques for measuring educational wastage are presented step-by-step. Some considerations on the conceptual framework of this problem in statistical terms are presented, and tentative definitions for certain terms are also given. Examples taken from published material and recent surveys showing the extent of grade repetition are included. Data on dropouts are not given. The main approaches to the study of wastage are reviewed, and the computational steps for evaluating educational wastage through the "reconstructed cohort" method are demonstrated in very simple terms. The basic principles and methodology as applied to a case study of Colombia are developed, and a comparative urban/rural analysis is made with a view to demonstrating the differential measurement of the components of educational wastage as compared with the national aggregate. Observations and suggestions on research to be carried out following the 32nd session of the International Conference on Education are made. Appendixes provide (1) selected list of studies and publications, and (2) three case studies (Dahomey, India, and Morocco). (Author/DB)

Studies and surveys in comparative education

A statistical study of wastage at school

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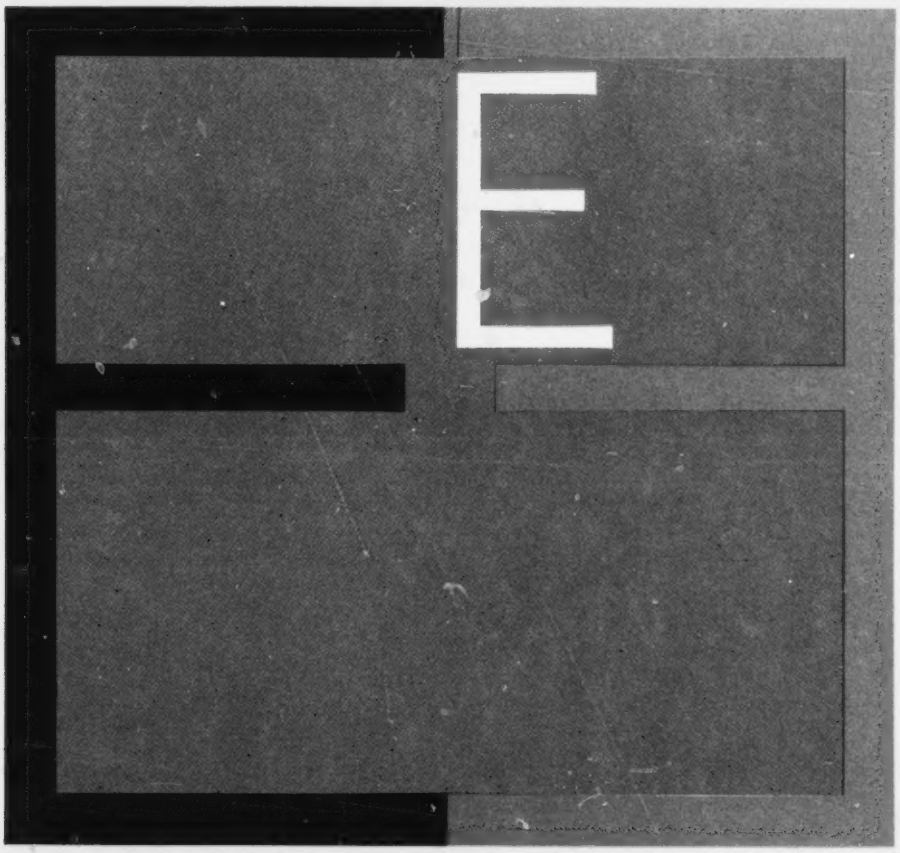

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Titles in this series

Wastage in education: a world problem
A statistical study of wastage at school

A statistical study of wastage at school

A study prepared for the International Bureau of Education by the Unesco Office of Statistics

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Preface

In 1969 the Unesco Office of Statistics issued a questionnaire to all Member States requesting information on school enrolments and repetition by grade and sex as a basis for carrying out a quantitative analysis of wastage at the first and second levels of education. At the same time, the International Bureau of Education in a separate inquiry sought information on the broader aspects of the problem: policies, problems, research activities, causes and remedies. Both surveys formed the basis of the two working papers submitted to the delegates of the International Conference on Education (Geneva, 1-9 July 1970) which had as one of its themes 'The improved effectiveness of educational systems particularly through reduction of wastage at all levels of instruction'.

The statistical treatment of the problem aroused considerable interest at the Conference and has since resulted in a large number of inquiries from many Member States. Furthermore, paragraph 31 of the Recommendation (No. 66) adopted by the Conference at the end of its discussion reads: 'The collection of data for national purposes should be standardized and organized systematically. To this end, reference should be made to the methods used in the Unesco survey on the statistical measurement of education wastage (1969), in order to calculate drop-out and repetition rates and (or) to assess the effectiveness of educational systems...'.

With this recommendation of the Conference in mind, and to assist Member States to continue their campaigns to reduce the incidence of educational wastage, the Secretariat has prepared this book. It is designed to be as far as possible a simple 'manual' to help those responsible for the collection and analysis of data on educational wastage.

The book has been prepared by the Unesco Office of Statistics, in co-operation with the International Bureau of Education, and is, in fact, the companion volume to the work recently published by Unesco : IBE, *Wastage*

in education: a world problem by Mr. M. A. Brimer (School of Education, Bristol University, United Kingdom) and Professor L. Pauli (Département de pédagogie, Ecole de psychologie et des sciences de l'éducation, Université de Genève, Switzerland). Both books have been issued under the Unesco: IBE series 'Studies and surveys in comparative education'.

It remains for the Secretariat to thank Member States and all those official agencies and their staffs for the efforts that were made to collect the data that made this work possible. Thanks are also due to Mr. M. A. Brimer who kindly wrote the introduction to the book.

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Introduction

The phenomena with which this work deals are complex and the data available for studying them are crude. Inevitably the term 'wastage' implies a value judgement of certain operations of an education system and there will be some who disagree that total loss can be ascribed to years spent repeating a previous grade or to the years that a drop-out has spent in school. Yet there can be no doubt that the International Conference on Education at its thirty-second session (Geneva, 1-9 July 1970) considered it desirable to reduce both repetition and drop-out as far as possible since they contribute to excessive educational expenditure and to a lowering of the effective educational output. Likewise, there will be those whose nations have virtually eliminated both drop-out and repetition by decree, who are aware that 'wastage' can occur without either and who may tend to regard analyses of such simple evidence of wastage as irrelevant to the fundamental loss of human resource. However, it is those countries which are the poorest and which have the lowest output from education who recognize wastage in these terms and most Member States have neither introduced automatic promotion nor eliminated drop-out.

Although the reliability of each country's system of gathering and reporting data to Unesco varies, the methods of treating them in this volume are a considerable improvement on those common in international studies. The most marked changes arise from the clear separation between drop-out and repetition, enabling more accurate estimates to be made of the contribution of each to wastage and of the over-all efficiency of the system through less ambiguous identification of the cohort flow. Perhaps even more important in terms of planning and policy formation, the treatment lends itself to projections and simulations and to the breakdown of the cohort into subflows needed to diagnose the particular malaise of the system. Indeed, a greater benefit arises for within-country analyses than for between-country comparisons.

The compilers have been careful to point out that while indices are available in comparable forms, direct comparisons between countries, even in terms of the most general characteristic of efficiency, are limited, for example,

by such fundamental differences as the proportion of the eligible population enrolled. Close awareness of the structure of the system, of policy changes affecting enrolment and promotion and transfer between cycles and of national events over the cohort duration is necessary to understand either a single cohort flow or differences in the flows of two or more cohorts within the same country. It is the insistence on careful interpretation that helps to make this book a valuable guide to the understanding of problems of educational wastage as well as a manual of appropriate procedures.

There are, as is readily admitted in the book, a number of refinements of the methods still to be made. These include the checking of assumptions about repetition and drop-out rates for repeaters which at the moment are regarded as being homogeneous with those of the rest of the cohort. Also, each cycle is at present treated separately and transition between cycles is not incorporated into the estimate of efficiency, although it is known that transition represents a critical point for drop-out. Future studies will cover the question of transition. Clearly, too, the severity of the implications of drop-out at the second level depends on the availability of forms of education outside the main system. Many countries have extensive further education facilities, both public and private, which permit studies to continue in the context of employment, and these facilities may be better adjusted to individual maturity and motivational factors than the formal school system. It will be necessary to find methods of accounting for the contribution of further and technical education in limiting the adverse consequences of second level drop-out in order not to exaggerate the incidence of wastage.

It is, however, in the last resort, the shortage of sufficient, relevant and reliable data which presents the most serious obstacle to any revolutionary breakthrough in the international study of educational wastage. While drop-out and repetition, enrolment and promotion are useful administrative categories of pupil movement they do not critically represent the decision-making events over which education systems exercise control, nor do they differentiate the factors external to the school system which are perhaps even more influential than those within. Above all, they pose the completion of a grade or a cycle as sufficient evidence of level of achievement without reference to the quality of output that the grade implies. Individualized record or cohort coding systems will certainly help to give more reliable data and will reveal the student flows more exactly. However, until wastage can be expressed as loss to society in terms of failure to reach target levels of achievement and this in its turn can be related to educational processes as well as the structure of the education system, the approach described in what follows must be regarded as the most effective that can be developed at the present time.

M. A. BRIMER

Chapter one

A statement of the problem

It is well known that all pupils admitted to the first grade of an educational cycle do not complete that cycle within the prescribed minimum period. Some of them *drop-out* before the end of the cycle and some *repeat* one or more grades before either dropping out or completing the last grade of the cycle successfully.

Whatever opinion one may have about the actual benefit derived by pupils from the time spent at school before dropping out, or the value of repetition, their significance is bound to vary according to different educational situations. Let us take for example the following two extreme situations:

1. Where the lack of available schools prevents a proportion of pupils from going beyond a given grade, or where the educational plan provides for a reduction in the enrolment ratio at a certain point.

2. Where, in spite of an adequate school capacity, a high proportion of pupils leaves school before completing the cycle; sometimes after repeating the same or other grades several times.

Clearly the significance of school drop-out and stagnation is different in each case and further information—e.g., jobs available for drop-outs, demand for qualified manpower, etc.—would permit a more accurate diagnosis. Then again, in the above two examples the real situation is oversimplified; but they are cited in order to introduce the qualified observations approach as opposed to generalizations about evils and remedies or, to put it more technically, to outline the statistical approach in educational planning exercises, where the logical sequence would consist of several steps:

1. The outputs from various stages of the education system are compared and each of them is related to the optimum capacity of that stage. It might be found (again in extreme cases) that either the sequence of the

output is fully satisfactory or one or more critical points are causing a deficient working of the education system.

2. Identification and analysis of the points of malfunctioning.

3. Evaluation of the consequences of such malfunctioning.

4. Investigation of the causes.

5. Proposed remedies and their implications.

It is at least certain that proper control, in the regulative sense, calls for a clear understanding of the way in which the education systems work. This can be better understood by examining educational wastage.

A considerable amount of research has already been devoted to this topic throughout the world and many studies are at present taking place for the purpose of evaluating in real terms the internal efficiency of education systems. Planners are aware that intake capacity and successful completion in any education system are directly related to repetition and holding power. The inter-relationship of these factors and their combined sequence determine the dynamics of most systems and play a key role in the precise unit cost of each successful completer, whether this be expressed in monetary or non-monetary terms.

Complex as the problem of educational wastage appears to be, it is evident that the statistical isolation and measurement of its factors could be of outstanding help not only to educational planners and policy makers but to all those responsible for education who, profiting from the resulting better knowledge of their own education systems could thus define the steps required for an optimum utilization of available resources.

The aim of the present study is thus to present in national terms and on a step-by-step basis a series of methods and techniques for measuring educational wastage. The importance of an efficient organization of national educational statistics for purposes of realistic national planning will be apparent. It should be stressed at this stage, however, that while the measures and indices computed in this study are valuable indicators of the internal efficiency of several systems and thus of their educational 'wastage', and are therefore useful operational tools, any comparison between countries has to be made with the greatest caution because of the differences in educational structures, proportion of children at school, pupil-teacher ratios, schools available, and so on. On the other hand, comparisons within a given country can be useful in demonstrating the various existing patterns of internal efficiency which would permit both for the identification of probable bottlenecks and the simulation exercises needed for overcoming them.

It is not possible here to cover all the important publications that have helped towards the understanding and measurement of educational wastage, but special reference must be made to those which have guided the modern methodological approach. First the Chipman Report on Venezuela [25][1] with its probabilistic approach and the theoretical and applied matrix method studies of D. Blot [3, 4]. Then the study by Isabelle Deblé [9] and the work produced by the *Institut d'étude du développement économique et social* of the University of Paris [19] are very significant. It could be said that, in fact, the 1960s saw the development of a new dynamic educational demographic approach. The problem under consideration was clearly stated in the survey that R. I. Brown and M. A. Brimer [5] submitted to the Unesco technical seminar on educational wastage and school dropouts (Bangkok) [27, 28].

The 1969 Unesco Statistical Survey. Within the framework of the 32nd session of the International Conference on Education (convened by Unesco and the International Bureau of Education, 1-9 July 1970), the Unesco Office of Statistics undertook, in 1969, the first of a series of surveys, the purpose of which was the statistical evaluation of educational wastage. As a preliminary step, a comprehensive review of the works and studies in this field was carried out for the purpose of retaining their main features and conclusions. It was found that, taking into consideration the present availability of statistical data, the only valid approach consisted in the establishment of flows of pupils and analyses of these flows.

In January 1969, a questionnaire on statistics of enrolment by grade (STE/Q/683) was sent to all Member States and their Territories. The questionnaire's coverage was restricted on this occasion to the first and general second levels of education for the school years from 1960/1961 to 1967/1968. Specific items included enrolment and repeaters by grade and sex for eight years, and enrolment by age and sex cross-classified by grade for two years only. Data on new entrants in the first grade, or real newcomers, were also requested. A second questionnaire has since been issued updating the information requested in the previous one and including the specialized types of education at the second level. A third questionnaire will follow, which, in addition, will request data on age distribution and newcomers at the third level of education.

The first questionnaire was answered by 148 Member States and Territories, although no more than 58 of them were able to provide data sufficiently complete to allow for analysis.

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1. The figures in brackets refer to the studies and publications listed in Appendix 1.

Based on a selected number of countries, a working paper was prepared for a meeting of experts on educational wastage which was convened by Unesco and the International Bureau of Education in Geneva from 10 to 14 November 1969 [29]. This was followed by a comprehensive study submitted to the 32nd session of the International Conference on Education [30], permitting an appreciation of the international character of educational wastage, deriving a set of indicators of internal efficiency, and ending with some proposals for further work in this field.

Some considerations on the conceptual framework of this problem in statistical terms are presented in the next chapter; tentative definitions for certain terms are also given as it appears that a major problem in this field is the lack of uniform definitions. Examples, taken from published material and recent surveys, showing the extent of repetition are included. Data on drop-outs are not given owing to their lack of consistency.

The third chapter reviews the main approaches to the study of wastage and demonstrates in very simple terms the computational steps for evaluating educational wastage through the 'reconstructed cohort' method. The basic principles and the methodology as applied to a case study of Colombia are developed in the fourth chapter, which also includes a comparative urban/rural analysis with a view to demonstrating the differential measurement of the components of educational wastage as compared with the national aggregate. The conclusion contains observations and suggestions on research to be carried out following upon the 32nd session of the International Conference on Education.

Chapter two

Flows and output in an education system

In the flow of a cohort of pupils through an education system, promotion, repetition and drop-out are events which are determined by educational factors (e.g. examination results), by social factors (e.g. migration) and by morbidity (e.g. death).

The number of pupils in a cohort who complete a given educational cycle is generally accepted as a measure of its output, but it is necessary to analyse the paths leading to the completion of a cycle—i.e., the observed process which reconstructs the student flows—in order to evaluate its dynamics.

At this stage it is essential to describe *wastage* in a manner which recognizes the limitation of the available data and which seems to give a succinct, unambiguous statistical description. Planners and statisticians consider school flows in relation to a given sequence of transitions within a prescribed period of time. Thus, unless an educational plan states the contrary, pupils entering a given cycle are supposed to aim at completing it within the prescribed period —the duration of that cycle. In this context, a drop-out is wasteful, even if the pupil who drops out after several grades without finishing the cycle did, in fact, gain a basic knowledge that raised his level of educational attainment. The level of attainment concept leads to an assessment of the degree and quality of output while, within the more limited definition, the measurement of wastage must be in terms of the dynamics of school populations in relation to the flow of pupils. Similarly, *repetition* is regarded as wasteful, since repeaters reduce the intake capacity of the grade in which they repeat and thereby prevent other children from entering school or cause over-crowding of classrooms, thus increasing education costs. This is an essentially different notion from that which regards repetition as an appropriate investment in pupil recovery. These ways of regarding repetition and drop-out are equally valid for the developing countries and the more advanced ones.

The following tentative definitions may serve for reaching a standard method of approach:

Drop-out or school desertion: Leaving school before the completion of a given stage of education or leaving at some intermediate or non-terminal point in a cycle of schooling.

Repetition: A year spent by a pupil doing the same work in the same grade as in his previous year in school.

Educational wastage: Incidence, in a country's education system, of drop-out and repetition.

DROP-OUT

Drop-out may be only provisional and pupils leaving the school system may, and often do, become reintegrated. Two different situations can then arise. A pupil may return to the same grade in which he was enrolled during his last school year, in which case he is counted as a repeater, or he may join the next higher grade and be counted as promoted. A drop-out may have received a considerable amount of education so that in educational terms it would not be correct to consider all his school career as wastage. Nevertheless, from the point of view of economic evaluation, it is more acceptable at the first level of education than at the second, to regard drop-out as contributing nothing to output. Second level drop-outs, assuming that they do not join another type of second level education (vocational, technical, teacher training, etc.), may more profitably contribute to the economy. In terms of implicit educational intention, evident in the organization of educational cycles and in the setting of educational goals, there is waste. Figures on drop-out call for different interpretations, according to the particular case, because in some countries, especially in the less developed districts, schools do not go beyond certain grades and distance may prevent the pupils from continuing the cycle by attending school in other centres. In other cases, the school capacity might exclude the promotion of more than a given proportion of children in a given grade. It is clear, therefore, that this problem which may differ in each national system and may have different aspects within the same country, depending on the district, age of the pupils, labour market conditions, socio-economic milieu, and so on, needs to be thoroughly investigated.

The extent and meaning of drop-out can therefore be evaluated according to each situation. For example, in Madagascar [14], only 24.4 per cent of first-level entrants complete this level successfully; this means that 3 pupils out of every 4 starting, dropped out. The pattern is as follows:

	Grade						Total
	1	2	3	4	5	6	
Per cent drop-out of total cohort	18.5	12.5	14.7	23.4	6.5	—	75.6

Two main points emerge from these figures: (a) 45.7 per cent (18.5+12.5 +14.7) of the enrolment dropped out before the fourth grade—or in other words, two-thirds of the drop-out took place before pupils could attain what is defined in the report as the threshold of literacy; (b) only 54.3 per cent of the total enrolment reached the fourth grade and could therefore be considered as potential literates.

The importance of this type of information cannot be overemphasized. Whether educational administrators are interested in the evaluation of performance in a particular group of schools, or planners wish to assess the effectiveness of an education system in order to consider future developments based upon feasible changes (such as educational projections, quantification of policy decisions), it is clear that a knowledge of how the education system works is essential.

REPETITION

The second component of educational wastage, repetition, is of major importance in its contribution to heavier costs as can be seen from the above-mentioned report on Madagascar, where it is shown that 34.0 per cent of the available places in the enrolment were taken up by repeaters, their distribution according to grades being as follows:

	Grade					
	1	2	3	4	5	6
Repetition as percentage of enrolment in each grade	39.8	31.6	28.5	31.8	25.9	43.5

Some idea of the extent of repetition is shown in Table 1 which gives the rates[1] by grade, for boys and girls, at the first level of education in various countries for which data were available between 1966 and 1968.

1. The 'repetition rate' is defined in Chapter 3.

Table 1
Rates of repetition for selected countries: first level of education (boys and girls)

Country	Year	Grade							
		1	2	3	4	5	6	7	8
Africa									
Algeria	1967/68	10.5	11.0	17.5	20.3	17.3	19.7	—	—
Botswana	1966/67	25.7	20.9	23.2	19.1	17.4	19.8	47.6	—
Burundi	1966/67	25.9	20.3	20.0	18.3	21.3	24.9	—	—
Chad	1967/68	42.4	32.6	30.3	27.6	29.5	54.0	—	—
Congo, Peoples Republic	1966/67	35.5	25.9	24.6	22.5	24.7	40.7	—	—
Gabon	1966/67	48.8	27.3	26.8	24.0	26.9	50.6	—	—
Mali	1966/67	27.4	29.9	30.7	34.1	49.0	—	—	—
Morocco	1968/69	23.8	21.9	27.0	30.8	50.2	—	—	—
Rwanda	1966/67	34.7	23.2	21.2	22.3	20.8	34.0	—	—
Togo	1967/68	46.0	28.5	34.6	28.8	34.6	45.3	—	—
Upper Volta	1966/67	12.5	12.9	15.2	16.6	16.4	30.9	—	—
Latin America									
Argentina	1966/67	22.9	13.6	11.1	9.2	6.4	4.4	1.7	—
Brazil	1967/68	30.1	19.2	17.1	11.6	—	—	—	—
Colombia	1967/68	24.0	18.9	15.7	11.7	9.7	—	—	—
Dominican Republic	1967/68	35.2	19.2	17.3	12.9	11.3	8.6	—	—
Guatemala	1967/68	25.9	16.7	14.6	11.9	7.4	2.8	—	—
Mexico	1967/68	20.2	12.6	12.2	10.4	8.5	3.5	—	—
Panama	1966/67	27.2	20.1	19.2	15.6	12.8	5.6	—	—
Paraguay	1967/68	26.3	20.7	14.8	10.1	6.0	4.9	—	—
Uruguay	1968/69	31.2	22.1	17.7	15.8	13.5	6.6	—	—
Venezuela	1967/68	18.5	10.1	11.6	11.3	8.4	3.9	—	—
Asia									
Iran	1966/67	13.7	13.8	11.0	9.0	9.5	10.3	—	—
Kuwait	1967/68	16.0	14.3	18.1	14.9	—	—	—	—
Thailand	1967/68	28.8*	17.8	17.2	8.1	12.8**	7.4	6.4	—
Europe									
Bulgaria	1966/67	8.0	5.5	4.7	4.7	10.4	6.8	5.4	3.4
Hungary	1966/67	8.8	5.3	4.2	3.4	5.9	4.3	2.8	0.5
Italy	1966/67	12.6	10.8	10.2	9.7	8.6	—	—	—
Portugal	1966/67	33.5	21.7	17.7	18.3	—	—	—	—
Romania	1966/67	10.0	5.2	4.6	4.3	9.9	7.2	7.6	3.6
Yugoslavia	1966/67	10.7	8.3	7.5	7.0	13.8	13.8	11.6	3.5

* Lower stage ** Upper stage.

Table 2
Rates of repetition for selected countries: general second level of education (boys and girls)

Country	Year	Grade in first cycle				Grade in second cycle				
		1	2	3	4	1	2	3	4	5
Africa										
Algeria	1966/67	12.0	10.4	11.6	16.9	10.9	28.9	18.2	—	
Botswana	1966/67	0.9	4.6	7.3	—	3.6	7.5	—	—	
Burundi	1966/67	5.3	4.4	4.0	—	3.5	4.5	0.0	—	
Central African Republic	1966/67	19.4	17.4	17.8	29.3	14.3	16.4	24.2	—	
Chad	1967/68	14.4	20.8	23.3	27.2	—	—	—	—	
Congo, Peoples Republic	1966/67	18.9	22.4	24.8	28.9	15.0	20.6	31.5	—	
Dahomey	1966/67	14.2	15.8	16.3	28.4	20.6	22.8	18.5	—	
Gabon	1966/67	15.9	12.9	16.6	20.0	9.8	25.5	31.1	—	
Mali	1966/67	25.1	19.3	19.4	33.7	8.5	36.4	29.7	—	
U.A.R.	1966/67	2.4	4.3	21.0	—	7.4	14.1	25.4	—	
Upper Volta	1966/67	15.4	12.0	14.3	26.5	—	—	—	—	
Latin America										
Argentina	1966/67	13.6	11.8	11.0	—	8.0	1.9			
Brazil	1967/68	17.4	14.3	11.1	6.9	8.9	5.5	2.2	—	
Colombia	1967/68	11.2	8.5	7.4	—	5.1	3.7	3.5	—	
Guatemala	1967/68	10.3	10.0	8.9	—	—	—	—	—	
Panama	1966/67	17.7	13.5	9.8	—	9.5	8.5	2.8	—	
Venezuela	1967/68	4.0	7.6	11.0	—	7.8	5.6	—	—	
Asia										
Iran	1966/67	19.0	13.5	14.4	—	14.3	9.0	16.7	—	
Kuwait	1967/68	21.2	19.3	17.2	27.0	24.9	15.7	25.5	45.7	
Syria	1966/67	10.3	8.5	29.6	—	5.7	5.3	29.6	—	
Thailand	1966/67	16.4	17.0	4.9	—	39.8	44.5	—	—	
Europe										
Bulgaria	1966/67	7.8	7.9	3.4	—	—	—	—	—	
Hungary	1966/67	1.8	2.2	1.8	0.2	—	—	—	—	
Italy	1966/67	15.5	12.4	8.5	—	12.5	9.0	10.0	6.5	9.5
Romania	1966/67	7.2	7.8	1.5	—	—	—	—	—	—
Yugoslavia	1966/67	9.2	10.3	7.4	2.5	—	—	—	—	

It can be seen that in many countries one-quarter to nearly one-half of the pupils enrolled in first level of education repeat the same grade the following year. It is also known that some repeat the same grade more than once. Thus,

if we take the first and last grades, we can calculate the range and median of repetition rates for each group of countries as follows:

	First grade		Last grade	
	range	median	range	median
Africa	10.5–48.8	25.7	19.7–54.0	40.7
Latin America	18.5–35.2	26.6	1.7–11.6	5.3
Asia	13.7–28.8	16.0	6.4–14.9	10.3
Europe	8.0–33.5	10.4	0.5–18.3	3.6

It appears that repetition rates are lower towards the end of the cycle than they are in first grade, with the exception of the African countries concerned which, in general, show higher rates.

There is also considerable repetition at the general second level of education but, as Table 2 shows, its incidence is less than at the first level.

The summary below shows that during the first cycle the African and Asian countries have a relatively high repetition rate whereas the Latin American and European countries have low rates, decreasing towards the end of the cycle. In the case of second cycle, the figures available show higher rates of repetition in ascending grades for Asia and Africa, very high rates being attained in the former.

	First cycle				Second cycle			
	first grade		last grade		first grade		last grade	
	range	median	range	median	range	median	range	median
Africa	0.9–25.1	16.4	4.0–33.7	26.5	3.5–20.6	9.8	0.0–31.5	24.2
Latin America	4.0–17.7	12.4	6.9–11.0	9.4	5.1– 9.5	8.0	1.9– 5.6	3.5
Asia	10.3–21.2	17.7	4.9–29.6	20.7	5.7–39.8	19.6	16.7–45.7	37.7
Europe	1.8–15.5	7.8	0.2– 8.5	2.5	—	—	—	—

The above rates show repetition as a limiting factor, school capacity being directly related to the dynamics of the education system. The causes of repetition and drop-out are the subject of current educational investigation and research, which raises the question of the adequacy of the content, the organization and structure of education, among other *internal* factors, and at the same time that of the economic, social, political, religious and cultural constraints operating as factors *external* to the education system.

As far as the scope of this study permits, references will be made to recent work assessing the influence of repetition on the school output. The summary data given below express the problem in relative terms, which is most

important. Thus an investigation undertaken by several countries consisted in retracing the school career of pupils completing their cycle of education. Naturally, those who had previously withdrawn from school were not considered, and the object of these exercises was to determine the actual length of studies of pupils, whose attendance at school was sometimes extended several years beyond the prescribed duration of their cycle.

In the case of Ecuador, the percentage distribution of pupils completing the first level in 1967/68 with or without one year or more of repetition was:

	Boys	Girls
	%	%
No repetition	58.2	58.6
Repeating 1 year	31.8	32.5
Repeating more than 1 year	10.0	8.9

Source: Report to the International Bureau of Education, 1970.

This means that only 58 per cent of the pupils completing first level education in Ecuador in 1967/68 did so within the prescribed duration of 6 years in that level, while about 32 per cent of them spent 7 years and the remaining 10 per cent of boys and 9 per cent of girls spent at least 8 years. This in itself suggests a certain pattern of survival in school, having implications which ought to be examined in the interests of efficiency.

A study undertaken in the Central African Republic reconstructed the school career of 11,315 out of 12,565 pupils enrolled in the last grade (sixth) of first level education (i.e. 90 per cent of total) in 1967/68, as follows:

	Pupils	Number of years spent at school
	%	
No repetition	16.2	5
Repeating		
1 year	30.0	6
2 years	32.0	7
3 years	16.0	8
4 years	5.0	9
5 years	0.7	10
6 years	0.1	11

Source: Ministère de l'éducation. *Statistiques scolaires*, 1967/68, p. 19.

It can be seen that, for instance, 90 pupils spent as much as 10 years (instead of 5) and 11 even spent a total of 11 years.

Another investigation in Chad (covering 86 per cent of the 13,670 pupils in the last grade of the first level, i.e. sixth grade) shows the following:

	Pupils
	%
No repetition	39.1
Repeating	
1 year	39.9
2 years	17.0
3 years or more	4.0

Source: Ministère de l'éducation. *Statistiques scolaires*, 1967/68, pp. 12 et seq.

A recent study in People's Republic of the Congo (Brazzaville) shows the number of years spent in school according to percentage distribution of pupils enrolled in the last grade (sixth) of first level education in 1968/69, as follows:

Number of years spent at school	Pupils
	%
6	13.1
7	32.0
8	34.9
9	16.3
10	3.1
11	0.5
12	0.1

Source: Ministère de l'éducation. *Statistiques scolaires*, 1968/69, pp. 17 et seq.

A study on Ivory Coast shown the percentage distribution of pupils entering the last grade of first level education, i.e. sixth grade, in 1967/68 as follows:

	Pupils
	%
No repetition	32.4
Repeating	
1 year	37.8
2 years	24.4
3 years	4.4
4 years or more	1.0

Source: Ministère de l'éducation. *Statistiques scolaires, situation de l'enseignement au 1er janvier 1968*, pp. 39 et seq.

In the case of Togo, information on this subject is now available for the two subsequent school years. Thus the percentage distribution of pupils entering the last grade of the first level (sixth grade) in 1968/69 and 1969/70 was as follows:

	Boys		Girls	
	1968/69	1969/70	1968/69	1969/70
	%	%	%	%
No repetition	15.9	16.4	14.5	13.2
Repeating				
1 year	32.6	32.5	33.4	29.1
2 years	27.9	28.8	31.8	30.7
3 years	16.6	13.0	15.6	15.1
4 years	5.1	5.2	3.8	4.9
5 years	1.9	0.9	0.9	1.0
Unknown	—	3.2	—	6.0

Source: Ministère de l'éducation. *Statistiques scolaires*, 1968/69 and 1969/70.

Thus, out of a total number of pupils entering the last grade, only 13-16 per cent managed to do so without repeating, 32 per cent repeated 1 year, another 30 per cent 2 years and the remaining 20 per cent or so, 3-5 years.

The surveys undertaken by the *Institut d'étude du développement économique et social* (IEDES) in French-speaking African countries also provided very useful information with respect to Niger and Senegal in 1966/67 [20]. These surveys affected another group of pupils, those already in the first grade of the general second level of education, in other words excluding those who did not necessarily complete the first level and who did not transfer to the second level. The results obtained, from the point of view of their first level career, may be summarized as follows:

	Niger 1966/67		Senegal 1966/67	
	boys	girls	boys	girls
	%	%	%	%
No repetition	30.1	22.0	35.7	28.2
Repeating				
1 year	42.8	48.7	43.6	43.6
2 years	25.6	27.0	17.0	22.9
3 years or more	1.5	2.3	3.7	5.3

In both those countries the pattern of repetition was higher for girls than for boys and it appears that, even in such a selected group, 65-80 per cent repeated at least once.

Bearing all the above notions and facts in mind, we need to: quantify the factors of wastage, namely repetition and drop-out; estimate survival and promotion at any point in school life; identify critical points and bottlenecks; and gauge the over-all incidence of these two factors in terms of school efficiency and, what is more important, their individual contribution to educational wastage.

Chapter three

The statistical evaluation of educational wastage

Three major approaches can be distinguished: (a) a 'true cohort' method (b) an 'apparent cohort' method, and (c) a 'reconstructed cohort' method. It might be useful to define the word 'cohort' in demographic terms before considering its actual utilization in educational statistics.

Cohort: A group of persons who experience a certain event in a specified period of time: thus a birth cohort is a synonym for generation (i.e. group of persons born within a specified period of time) [12].

For the purpose of this study, however, 'cohort' will refer to a group of pupils joining the beginning grade of a course in a given year.

THE TRUE COHORT METHOD

The only sure way to determine the school career of a cohort and to measure precisely its flow patterns and its output sequence is through an individualized data system where each student has his own reference number and can be followed throughout his career. Such a method is used, for example, in Sweden and certain other developed countries.

As a substitute, one could use a 'cohort coding system' [7] whereby all students in a cohort experiencing the same educational events received the same coding number, as is used for example in Mauritius. The data thus collected permit the derivation, through the aggregation of yearly data, of the movements of school population.

THE APPARENT COHORT METHOD

In this method the enrolment in grade 1 in a particular year is compared with enrolment in successive grades during successive years and it is assumed that the decrease from each grade to the next corresponds to wastage. This

method, the most commonly used so far, produces very approximate estimates of drop-out; but its main weakness is that it assumes that children are either promoted or else drop out of the school system. Repetition is thus ignored and therefore a factor, very often of paramount importance, is overlooked. The difference between considering the repetition factor and neglecting it will be demonstrated later in this chapter, in connexion with the Thailand data, but it is clear that the estimation of wastage by this method is incorrect. A still more questionable application of this method consists of using cross-sectional year-grade data (i.e. enrolment in all grades in a single year).

An alternative approach, suggested by J. D. Chesswas [6], mainly consists of calculating the ratios of the enrolment in a grade in a given year to the enrolment in the previous grade in the previous year (defined as ' progression ' rate) for all the grades and for all the years in a time-series data.

In spite of the limitations mentioned above (namely, the ignoring of repetition), in those cases where data on repeaters are not available the apparent cohort method can naturally provide some indications as to the working of the education system and particularly with regard to transition. The complement to transition, however, should not be confused with educational wastage.

THE RECONSTRUCTED COHORT METHOD

When the enrolment by grade and the pupils repeating each grade in each year are know, it is possible to derive the rates of promotion, repetition and drop-out. In other words, we can reconstruct the school ' history ' for each grade from one year to the following year. The example below shows the empirical treatment of the statistical data in the case of Colombia.[1]

Year and category	Total all grades first level	Grade				
		1	2	3	4	5
1967						
Total enrolment	2 586 288	1 019 967	628 069	408 427	298 992	230 833
of which repeaters	482 400	246 532	125 036	58 811	32 592	19 429
1968						
Total enrolment	2 733 432	1 056 066	659 476	449 154	317 862	250 874
of which repeaters	484 884	244 402	118 862	64 053	35 112	22 455

Source: Extract from Unesco questionnaire on 'Statistics of Enrolment by Grade' (STE/Q/683), 1969.

1. Data for Colombia are available from 1960 to 1968 inclusive, but only the last two years are shown at this stage in order to limit the number of computations.

The above data call for various comments. First they indicate the total number of *newcomers* into first level education. This is in fact the net intake of the educational system and is obtained by subtracting the corresponding repeaters from grade 1 enrolment, as follows:

Year	Grade 1 enrolment	minus	Grade 1 repetition	equals	Newcomers into the level
1967	1 019 967		246 532		773 435
1968	1 056 066		244 402		811 664

Secondly, we can derive the *proportion* of repeaters (not to be confused with the *rate* of repetition which will be defined below) which in itself is a very useful piece of information. This is obtained by dividing the repeaters by the enrolment in its corresponding grade. Thus we estimate the proportion of repeaters in grade 1 in 1967 at 24.2 per cent (i.e. $\frac{246,532}{1,019,967}$), which means that 24.2 per cent of the pupils enrolled in first grade in 1967 were repeaters. The following table shows the proportion of repeaters in each grade, for 1967 and 1968.

Year	Total first level	Grade				
		1	2	3	4	5
1967	18.7	24.2	19.9	14.4	10.9	8.4
1968	17.7	23.1	18.0	14.3	11.0	9.0

Thirdly, we can *reconstruct* the movement of each grade from one year to the following year, thus showing the dynamics of the education system. This may be compared to the 'apparent cohort' method. We could, by this last method, estimate a transition from grade 1 to grade 2 of 64.7 per cent (i.e. $\frac{659,476}{1,019,967}$) and, consequently, a drop-out of 35.3 per cent (i.e. 100.0 – 64.7 per cent).

This picture, in fact, is distorted and the data available in the extract from the statistical questionnaire enables a logical reconstruction to be opposed to the apparent ratio.

It we consider the 1,019,967 pupils enrolled in grade 1 in 1967 we can make the following estimations:

(a) It is true that the following year (1968) there were 659,476 in the following grade (grade 2). But, of these, 118,862 were repeaters and therefore came

from grade 2 in 1967. Thus, only 540,614 (i.e. 659,476 – 118,868) came from grade 1 in 1967 and can be considered as *promoted.*

(b) In 1968 there were 244,402 pupils who *repeated* grade 1 and, by definition, came from grade 1 in 1967.

(c) If we subtract from grade 1 enrolment in 1967 (i.e. 1,019,967) the pupils *promoted* and the pupils *repeating* (i.e. 540,614 + 244,402 = 785,016), it appears that there are as many as 234,951 pupils who are no longer at school the following year and we can consider them as *drop-outs.* This can be expressed graphically:

Diagram 1

Colombia: Movement of enrolment in grade 1, from 1967 to 1968. Note that means *promotion,* means *repetition* and means *drop-out*

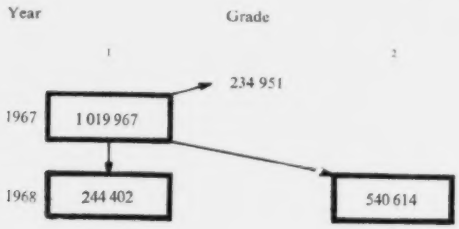
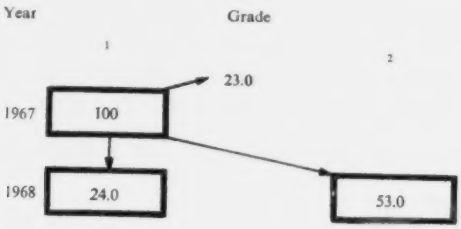


Diagram 2

Colombia: The same data converted into percentages, i.e. taking 1 019 967 = 100



The three developments of the original data add up to total value:

	Promotion		Repetition		Drop-out	Total
Pupils	540 614		244 402	+	234 951	= 1 019 967
Percentage	53.0	+	24.0	+	23.0	= 100.0

The above percentages permit a very simple comparison with apparent cohort estimation and we observe that: (a) the actual *drop-out* was 23.0 per cent (instead of 35.3 per cent); and (b) the actual *promotion* was 53.0 per cent (instead of 64.7 per cent).

In other words—in addition to neglecting 24.0 per cent of repeaters—drop-out and promotion are wrongly estimated (in the example we have taken both are overestimated). Moreover, the notion of wastage is only fully stated if both drop-out and repetition are described, without confusing their meaning.[1]

It is clear that Diagrams 1 and 2 refer to the *same* data and both represent the same school movements. The underlying idea in Diagram 2 is the assumption that the enrolment in grade 1 the first year (or, as it is often expressed 'grade *g* in year *y*') can be assimilated into a *cohort* in the educational sense, i.e. a group of pupils joining the first grade of a course in a given year. This assumption is questionable since the initial enrolment includes repeaters and thus, for instance, the pupils promoted comprise a proportion of the pupils having previously repeated the same grade. Thus, in the case of Colombia, it is known that there were 773,435 newcomers to grade 1 (that could actually be identified as a 'cohort'), and the question then arises; is it therefore correct to translate the *total* enrolment in grade 1 (1,019,967) as a starting group represented by 100 (as in Diagram 2), and to represent the subsequent developments (53.0 per cent promotion, 24.0 per cent repetition and 23.0 per cent drop-out)?

To reject this assumption it would be necessary to assume a different probability of promotion, repetition and drop-out for the repeaters in the grade (246,532) and the newcomers (733,435). This might well be so but until current research on this point provides answers to the question, it seems reasonable to work on the assumption of equal or homogeneous probability for both groups of pupils to be promoted, to repeat or to drop-out.

The same operations as for grade 1 are performed for the following grades. Thus, for instance, for *grade 2*, we can retrace the movement to 1968 of the 628,069 pupils enrolled in 1967 in that grade:

(a) There were 449,154 pupils in the following grade (grade 3) in 1968. 64,053 of them were *repeaters* and, therefore, coming from grade 3 in 1967; 385,101 only (i.e., 449,154 – 64,053) were therefore *promoted* to grade 3 from grade 2, i.e., 61.3 per cent of the 1967 enrolment in grade 2.

(b) 118,862 pupils *repeated* grade 2 in 1968 and were therefore in the same grade in 1967. This represents 18.9 per cent of the 1967 enrolment in grade 2.

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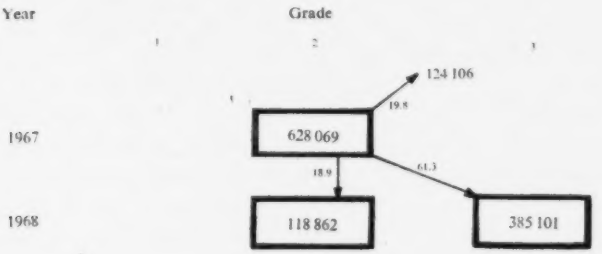
1. See note at the end of this chapter on comparative results of 'apparent cohort' and 'reconstructed cohort' analysis.

(c) Subtracting from enrolment in grade 2 in 1967 (i.e. 628,069) the pupils *promoted* and the pupils *repeating* (i.e. 385,101 + 118,862 = 503,963) we find that 124,106 pupils left the school system the following year and can be considered as drop-outs. They represent 19.8 per cent of the enrolment in grade 2 in 1967. This percentage could also have been obtained by subtracting the percentage of pupils promoted plus the percentage of pupils repeating from 100. (Thus, 100 – (61.3 + 18.9) = 19.8 per cent). This can be represented (merging Diagram 1 and 2) as follows:

Diagram 3

Showing simultaneously both the actual number of pupils involved and their percentage distribution



Repeating the above computations, grade by grade, for the data on Colombia, the movement of all grades in 1967 is obtained (Table 3).

Table 3
Colombia: Movement of all grades in 1967/1968

			23.0		19.8		15.1		11.9		9.8
Year	Category	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
1967	Enrolment	1 019 967		628 069		408 427		298 992		230 833	
	Drop-outs	234 959		124 110		61 624		35 469		22 676	
	Promoted	540 606		385 097		282 750		228 419		185 702 *	80.5
	Repeaters	244 402		118 862		64 035		35 112		22 455	
		24.0	53.0	18.9	61.3	15.7	69.2	11.7	76.4	9.7	
1968	Repeaters	244 402		118 862		64 053		35 112		22 455	
	Newcomers	811 676		540 606		385 057		282 750		228 419	
	Enrolment	1 056 078		659 468		449 150		317 862		250 874	

* Reported as successfully passing the final examination for this grade.

Interesting as this kind of analytical statement may be, it is evident that when obtained for several successive years (if possible covering the full school cycle) it provides an even more interesting picture of the education system and its dynamics. Thus, it will be seen in the relevant table prepared for Colombia in the next chapter that the observation of promotion, repetition and drop-out expressed in percentages (which will be defined further on and called 'rates') through several years, is of invaluable help in assessing the effectiveness of an education system.[1]

THE RECONSTRUCTION OF A COHORT

Two major phases lead to the reconstruction of a cohort: (a) the computation of the relevant rates—promotion, repetition and drop-out; and (b) their application on a year by year basis to establish flow diagrams.

Computational steps

The computations previously made for Colombia 1967 and 1968 can be formalized and the *percentages* so obtained called 'rates'. The actual sense of this term implies a dynamic ratio, i.e., the ratio of a given event (promotion, repetition, drop-out) in a year when derived from the previous year. The enrolment and repetition chart below will help towards understanding the way in which to compute the rates (this has in fact already been described in the previous pages) and also in their significance:

	Total enrolment		Number of repeaters	
	grade x	grade x + 1	grade x	grade x + 1
Year a	A	B	C	D
Year a + 1	E	F	G	H

If we can apply the above chart to the data on Colombia already referred to it will appear as follows:

	Total enrolment		Number of repeaters	
	grade 1	grade 2	grade 1	grade 2
1967	1 019 967	628 069	246 532	125 036
1968	1 056 066	659 476	244 402	118 862

1. See the case study on Dahomey in Appendix II for the treatment of special drop-out rates with negative signs.

The *promotion rate* for grade 'x' in year 'a' is the number of 'new' pupils in grade 'x + 1' in year 'a + 1' (without repeaters from the previous year's enrolment) expressed as a proportion of the total enrolment in grade 'x' in year 'a', i.e.

$$\frac{F - H}{A} \qquad (1)$$

$$= \frac{659{,}476 - 118{,}862}{1{,}019{,}967} = 0.530 \text{ (or 53 per cent)}$$

The *repetition rate* [1] for grade 'x' in year 'a' is the number of repeaters in grade 'x' in year 'a + 1' expressed as a proportion of the total enrolment in grade 'x' in year 'a', i.e.

$$\frac{G}{A} \qquad (2)$$

$$= \frac{244{,}402}{1{,}019{,}967} = 0.240 \text{ (or 24 per cent)}$$

The *drop-out rate* for grade 'x', year 'a' is the number who dropped out in grade 'x', year 'a' expressed as a proportion of the total enrolment in 'x', year 'a', i.e.

$$\frac{A - (F - H) - G}{A} \qquad (3)$$

$$= \frac{1{,}019{,}967 - (659{,}476 - 118{,}862) - 244{,}402}{1{,}019{,}967} = 0.230 \text{ (or 23 per cent)}$$

Thus, we have found the corresponding *rates*, equal to the percentages previously computed and this type of computation presents no practical difficulty.

Exactly the same operations can be formulated in somewhat more functional terms by using some symbolic algebraic conventions in educational statistics. The result is then as follows for each of the above formulae:
(i) The promotion rate may be expressed as:

$$p_y^g = \frac{P_{y+1}^{g+1}}{E_y^g} \qquad (1a)$$

1. Repetition proportion (or percentage) for grade 'x' year 'a' is the number of repeaters in grade 'x', in year 'a', expressed as a proportion of the total enrolment in grade 'x' in year 'a', i.e.

$$\frac{C}{A}$$

$$= \frac{246{,}532}{1{,}019{,}967} = 0.242 \text{ (or 24.2 per cent)}$$

where: p = promotion rate
P = pupils promoted (i.e. enrolled in that grade, minus repeaters)
g = grade
y = year
E = enrolment

i.e., the proportion of 'new' pupils in a given grade (that is, not including the repeaters enrolled) to the total enrolment in the previous grade the previous year.

(ii) The repetition rate will be:

$$r_y^g = \frac{R_{y+1}^g}{E_y^g} \qquad (2a)$$

where: r = repetition rate
R = repeaters

i.e., the proportion of repeaters in a given grade to the total enrolment in that grade the previous year.

The repetition *rate* should not be confused with the repetition *proportion* (or $\frac{R_y^g}{E_y^g}$) i.e. the proportion of repeaters in a given grade to the total enrolment in that grade the same year. This is often erroneously used as the repetition rate.

(iii) The drop-out rate is obtained as a residual:

$$d_y^g = 1.00 - (p+r) \qquad (3a)$$

It follows from the above formula that:

$$p+r+d = 1.00$$

except in those cases where unusual circumstances (migration into the country, important reintegration of pupils into the education system in the previous year, etc.) determine a *negative* drop-out rate. A concrete example of this is given in the study on Dahomey (Appendix II).

How to establish a flow diagram

The survival within a given cohort can be represented by means of a flow diagram showing year-by-year and grade-by-grade the reconstruction of the

cohort history in expected frequency terms. In education, as in demography, Lexis flow diagrams show very clearly the school network and prove to be practical and illuminating.

A flow of this type can take the form of Diagram 4 below, the symbols of which have already been defined. Thus, for example, E_y^1 means 'enrolment in grade 1 in the base year y'. R_{y+1}^1 means 'repeaters in grade 1 in year y + 1 or in the year following the base year'. Similarly, r_y^1 means 'repetition rate for grade 1 in the base year y'.

Diagram 4 gives rise to certain comments. It indicates in the first diagonal row of the flow (i.e., starting in year y grade 1, $E_y^1 \rightarrow E_{y+1}^2 \rightarrow E_{y+2}^3 \rightarrow$ output) the optimum pattern of progress at school. This is, normally, the way a selected number of pupils progresses at school (see previous chapter for observed successful completion without repetition), while the remainder either repeats or drops-out as shown in the diagram. Those repeating the following year (i.e., R_{y+1}^1), follow again the same movement as determined by the observed year-by-year relevant rates.

The flow represented in Diagram 4 provides for only two repetitions, which, as can be seen from the data already referred to, are the actual minimum in any system. Naturally when applying this method to any particular case, the pattern of repetition observed will indicate the required number of repetitions to be estimated.

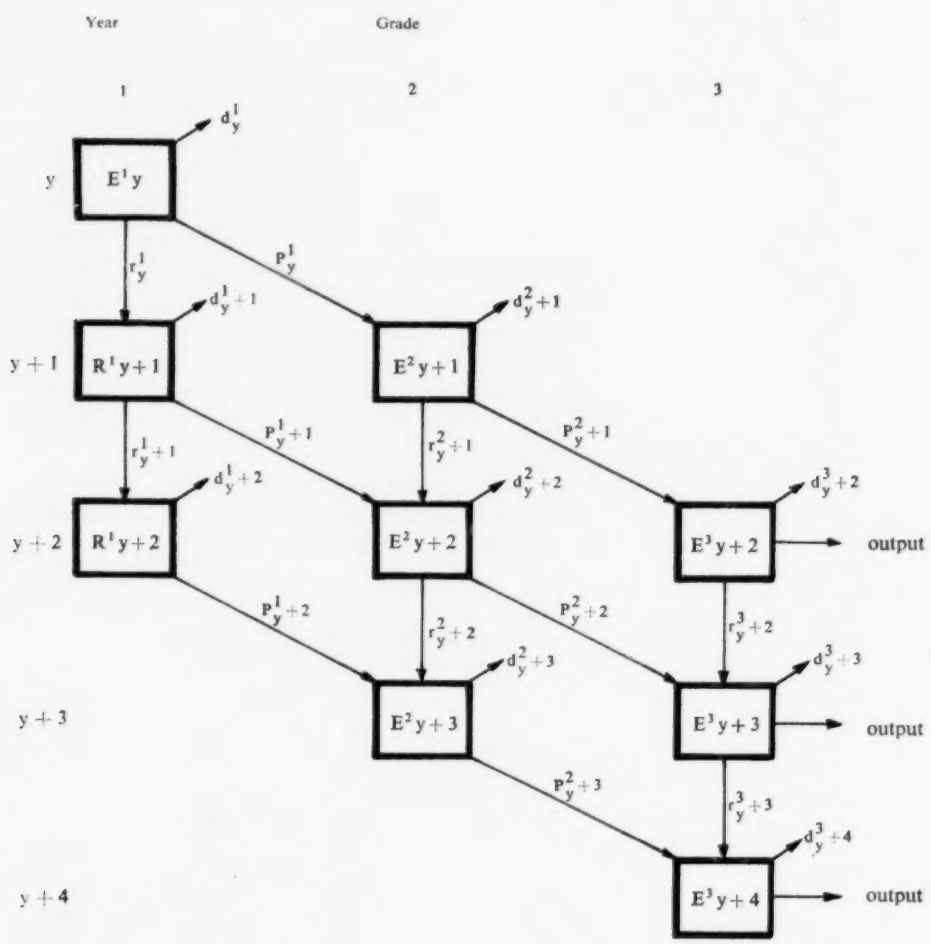
Since the available data do not allow for the separation of repeaters and newcomers into a grade from the point of view of their subsequent destination, it is therefore not possible to compute different rates, as stated before when referring to cohort composition. The working hypothesis, currently accepted in studies of this type, consists of the application of the same rates of repetition, drop-out and promotion to pupils who repeat a grade, as to the total enrolment in the grade where such pupils repeated. Thus a homogeneous behavioural pattern is assumed, which is itself currently under investigation as the present statistical data do not allow for the determination of the actual characteristics. Once these patterns are identified, the modification of the present assumption of 'equal' propensity to repeat or promote could be applied without any difficulty, should significant differences be observed.

Estimates on drop-outs include international migration and death. It is assumed that, in general, their statistical value is negligible but again, if the required parameters are known and significant, the computations can include them and thus refine the analytical value of the exercise.

Promotion rates for the last grade of a cycle can be derived only if data on successful completion of that grade are available (successful pass in final examination, transfer to another type of education, etc.). It seems, however, that in most countries, the incidence of real drop-out in such grades is very

Diagram 4

Showing year-by-year and grade-by-grade a cohort history



limited and that those pupils who do not complete the cycle successfully, repeat the following year unless they are entering a further type of education to which they are admitted without having passed the final examination referred to. Whatever the situation, the idea of drop-out at this stage is subject to reservation and this is the case with the 22,676 pupils in the Colombia example, in grade 5 in 1967 (see Table 3) who neither passed the examination nor repeated. In the last grade, therefore, the decision whether to neglect the extent of drop-out or to estimate a reasonable proportion based upon observation is left to individual judgement.

It should be emphasized that once the parameters, whose value is assumed in the previous working hypotheses, are known there would be no technical difficulty in substituting them and/or their modalities of application. Thus conventions could be reached as regards: (a) modification of subsequent repetition, by reducing the drop-out rate and increasing the promotion rate on a given basis; (b) alternative hypotheses could be followed (i.e. limitation or extension of the repetition times by grade or by level; and (c) the value of migration, death, etc. could be introduced into the computational steps if known or derived or estimated.

A concrete example of flow reconstruction will help in the understanding of the technical steps required. A case has been chosen in which the length of the cycle is reduced (only 3 grades) and the enrolment is small. Thus the figures can be manipulated easily. This will act as an introduction to the case study on Colombia given in the next chapter.

Table 4 below shows the answer to the questionnaire received from one country, with statistical data on enrolment by grade from 1964/65 to 1967/68 inclusive, and repeaters by grade from 1965/66 to 1967/68 inclusive.

Table 4
Enrolment and repeaters by grade

Year and category	Total enrolment	Grade		
		1	2	3
1964/65				
Total enrolment	696	363	225	108
of which repeaters	—	—	—	—
1965/66				
Total enrolment	786	446	240	100
of which repeaters	95	43	36	16
1966/67				
Total enrolment	1 035	594	311	130
of which repeaters	201	103	68	30
1967/68				
Total enrolment	1 451	812	416	223
of which repeaters	194	89	64	41

The above data permit the computation of the rates (promotion, repetition and drop-out) for 3 years, i.e. 1964/65, 1965/66 and 1966/67. This is explained by the fact that, for 1964/65 (although data on repeaters in that year are not available) we can derive the expected movement *up to* 1965/66. For instance, enrolment in grade 1 (363 pupils) moved as follow:

(a) 204 were promoted, i.e. 56.2 per cent (240 enrolled in grade 2 in 1965/66 minus 36 who repeated that grade and therefore came from grade 2 in 1964/65).

(b) 43 repeated grade 1, i.e. 11.8 per cent.

(c) therefore 116 (the complement of 204 + 43 to 363) dropped-out, i.e. 32.0 per cent.

The corresponding rates are: p = 56.2, r = 11.8, d = 32.0 adding up to 100.0. The same type of computation on a grade-by-grade and year-by-year basis allows the derivation of Diagram 5 (see page 38).

It will be seen that as regards the last grade, a hypothesis of 20 per cent drop-out in that grade was introduced, the other rates being the ones observed according to Table 5. It will be noted in the diagram that rates are shown between brackets and the corresponding pupil movements figure near them.

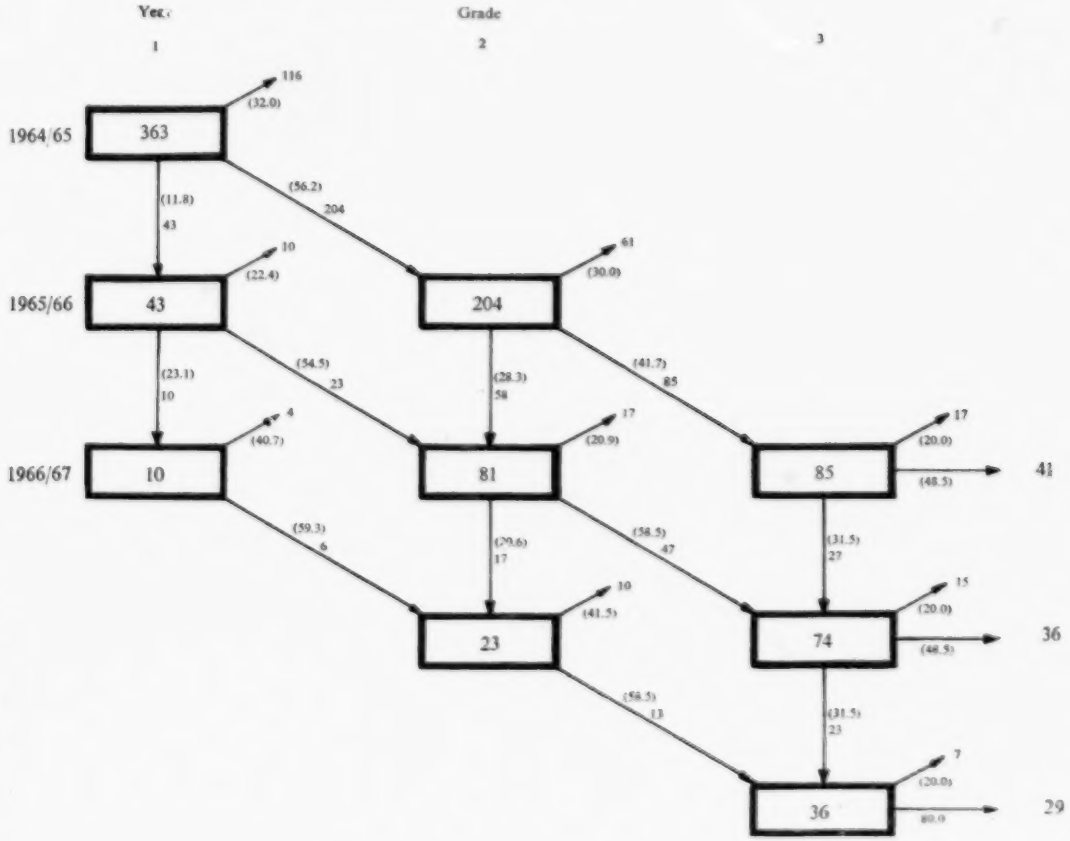
Table 5
Promotion, repetition and drop-out rates

Year	Category	Grade		
		1	2	3
1964/65	Repeaters	11.8	16.0	14.8
	Promoted	56.2	37.3	65.2
	Drop-out	32.0	46.7	20.0 •
1965/66	Repeaters	23.1	28.3	30.0
	Promoted	54.5	41.7	50.0
	Drop-out	22.4	30.0	20.0 •
1966/67	Repeaters	15.0	20.6	31.5
	Promoted	59.3	58.5	48.5
	Drop-out	25.7	20.9	20,0 •

• Estimated

The rates that can be derived for some countries are limited to a reduced number of successive years not covering the duration of a complete flow. In these cases and according to each situation, it is possible to proceed by either applying a derived set of rates accounting for the observed trend or, if judged realistic, maintaining on a constant basis the rates available for the latest year.

Diagram 5 The reconstructed history of 363 pupils year-by-year and grade-by-grade



Duration in years	
Grade 1	416
Grade 2	308
Grade 3	195
Total	919
Output	106
Pupil/years	8.67
Input/output	2.89

Diagram 5 contains the reconstructed history of 363 pupils entering grade 1 in 1964/65. From this, we can induce a number of conclusions of considerable interest:

(a) 41 of them (only) completed the cycle and completed it without repetition (or 11.3 per cent of the 363 pupils)

(b) 36 of them completed it one year later, which means that they repeated once (or 9.9 per cent)

(c) 29 of them repeated two years (or 8.0 per cent)

i.e., 106 pupils completed the cycle (or 29.2 per cent of the 363 pupils in grade 1 in 1964/65).

It appears therefore that 257 dropped-out of school during the total period as follows:

Grade		
1	2	3
116	—	—
10	61	—
4	17	17
—	10	15
—	—	7
130	88	39

More than 50 per cent of the over-all drop-out took place in grade 1 and by substracting them in each grade, the sequence of progression at each grade can be expressed as follows:

	Grade 1	Grade 2	Grade 3	
	363	▶233	▶145	▶106
	▼	▼	▼	
Drop-outs	130	88	39	

Another interesting calculation is the number of place-years occupied in each grade which is then related to the output of this 'cohort' and the result compared to the prescribed duration of the cycle. This is already shown in a small block at the left of the flow in Diagram 5. One can see that 416 place-years were used in grade 1 (i.e., 363 in 1964/65, 43 in 1965/66 and 10 in 1966/67).

Similar computations for each grade add up to 919 place-years. Since 106 pupils completed the cycle successfully, 8.67 places or pupil-years were required for each successful pupil (i.e. 919/106).

The ratio of pupil-years spent per successful completer to the normal or prescribed duration of the cycle shows the relationship between the actual pupil-years used by a cohort to produce the output from that cohort, on the one hand, and the minimum required on the other hand. This indicator is known as the 'input/output ratio' [1].

Relating the derived pupil-years invested per successful completer to the prescribed duration of the cycle—in this case 3 years—we obtain the input/output ratio. Thus, 8.67/3 = 2.89 (instead of 1.00 which would mean optimum efficiency).

Diagram 6 is a conversion of Diagram 5, so as to express the movements of the cohort into a more significant and more comparable picture. Thus, the starting cohort is converted into an index of 1,000 and all operations are consequently translated in 'per thousand' terms.

Thus, there is no difference between the following statements (the first being taken from Diagram 5 and the second from Diagram 6):

204 pupils (out of 363) were promoted in 1965/66 to grade 2, i.e. 56.2 per cent.
or 562 pupils (per 1,000), i.e. 56.2 per cent.

43 pupils (out of 363) repeated grade 1 in 1965/66, i.e. 11.8 per cent.
or 118 pupils (per 1,000), i.e. 11.8 per cent.

41 pupils (out of 363) completed the cycle without repetition, i.e. 11.3 per cent.
or 113 pupils (per 1,000), i.e. 11.3 per cent.

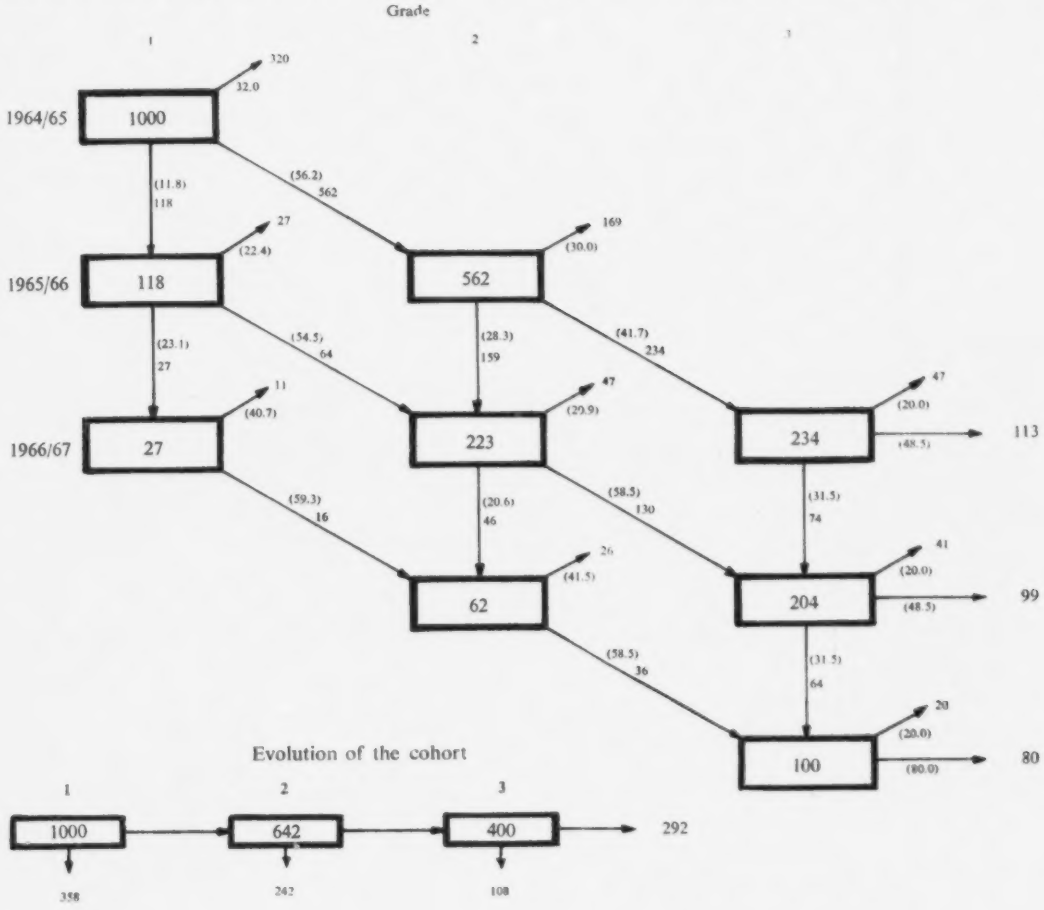
106 pupils (out of 363) completed the cycle with or without repetition, i.e. 29.2 per cent.
or 292 pupils (per 1,000), i.e. 29.2 per cent.

The convenience of converting the cohort into an index of 1,000 is easily understood: in practical terms this means reconstructing a cohort by multiplying each and every rate observed in successive steps. Thus, the first diagonal row is obtained by multiplying the successive promotion rates for grades 1, 2 and 3 as shown in Table 5, for the years 1964/65, 1965/66 and 1966/67; the repetition and drop-out rates are then applied to obtain the second row (Diagram 7).

---

1. Several studies on this subject have used a similar concept of 'wastage ratio' and in others a 'coefficient of efficiency' is derived, which in practice is the reciprocal of the input/output ratio, i.e. the relation between the minimum pupil-years required by a cohort to produce the output and the actual pupil-years used.

Diagram 6 A conversion of Diagram 5, expressing the movements of the cohort in more significant and comparable terms

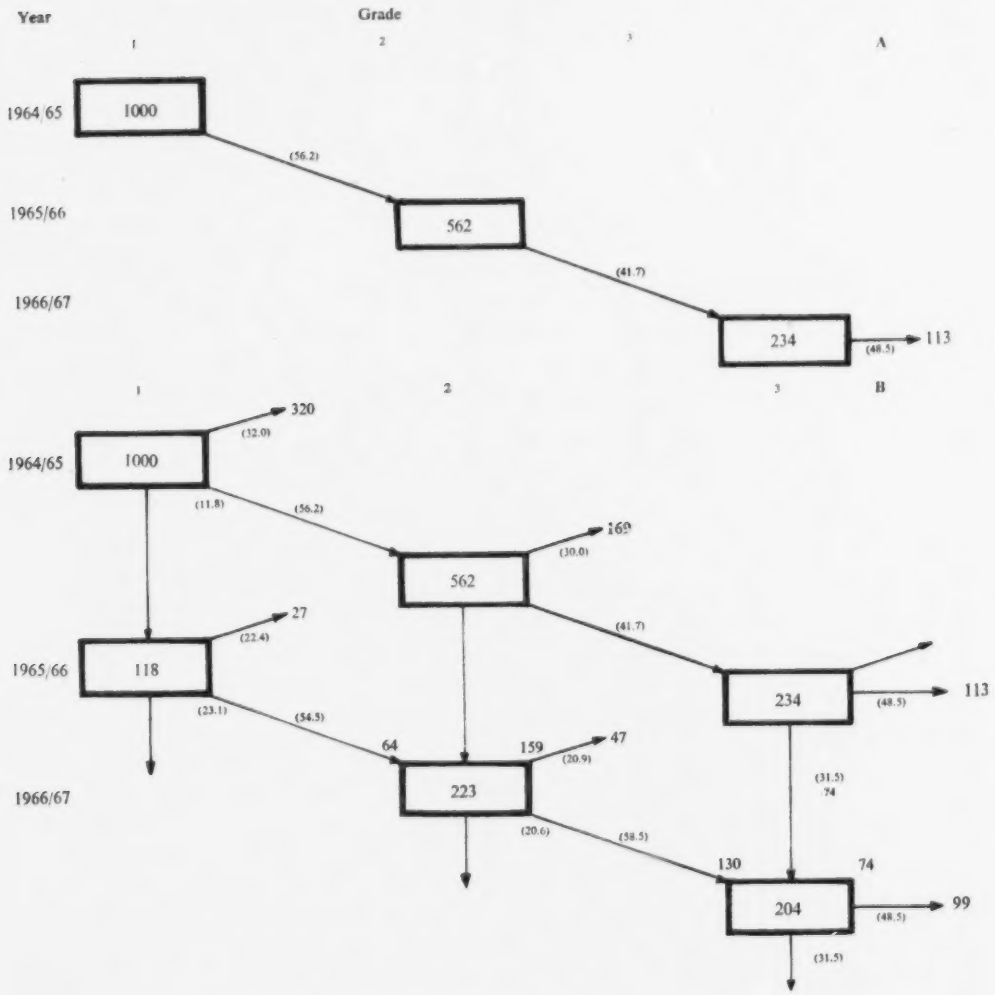


Duration in years	
Grade 1	1 145
Grade 2	847
Grade 3	538
Total	2 530
Output	292
Pupil/years	8.67
Input/output	2.89

Evolution of the cohort

Diagram 7

Derivation of the cohort by use of the promotion, repetition and drop-out rates

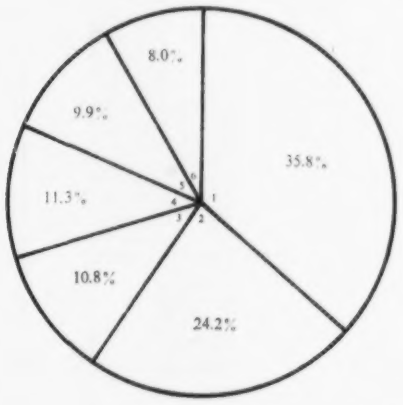


It was this procedure that was used to establish the flow of Diagram 6, which is in fact the equivalent of the flow in Diagram 5. The interest of reconstructing the cohort on the basis of 1,000 instead of the actual enrolment is thus demonstrated for the sake of faster computation and further utilization of findings in terms of percentages. The reconversion of indices and percentages into actual figures is, in itself, a very elementary operation.

Diagram 8 (see below) shows the percentage distribution of the output for six subsequent stages and its graphic presentation enables one to appreciate that, for instance, 60 per cent of the cohort studied (i.e. 35.8 + 24.2 per cent) left school with less than two years of schooling (items 1 and 2); 11.3 per cent of them (item 4) completed the cycle without repetition and so on.

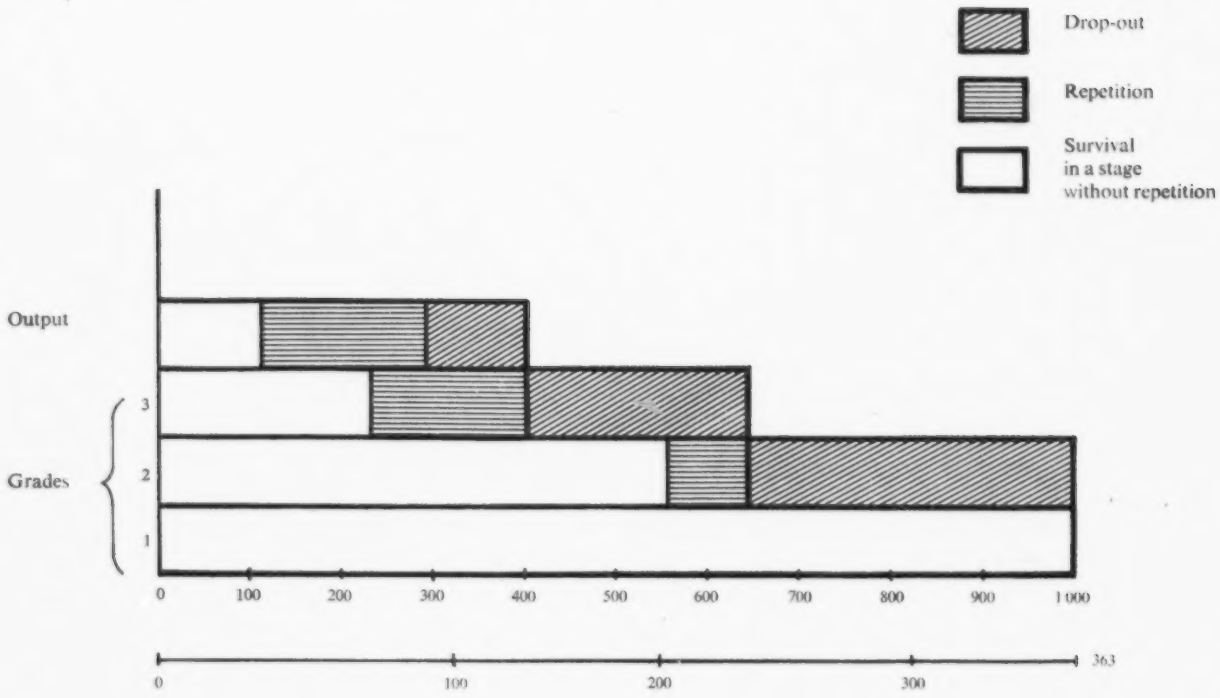
A synthetic view of this case is shown in Diagram 9 (page 44) which shows the extent of (a) survival at school without repetition, (b) progression by repeating, and (c) drop-out at each stage. It will be seen that both scales are given (i.e. measurement of each event in terms of the 363 pupils or expressed in terms of per 1,000). Thus, looking at the centre of the 1,000 scale (i.e. 500) the corresponding scale in terms of 363 pupils is between 181 and 182, and so on.

Diagram 8
Percentage distribution of the output by flows in Diagrams 5 and 6



	Out of 363	Per 1,000
(1) 1 grade or less	130	358
(2) More than 1 grade and up to 2 grades completed	88	242
(3) More than 2 grades and up to 3 grades completed	39	108
(4) Cycle completed without repetition	41	113
(5) Cycle completed with 1 year of repetition	36	99
(6) Cycle completed with 2 years of repetition	29	80

Diagram 9 Process of school survival (derived from Diagrams 5 and 6)



THE INDICATORS OF EDUCATIONAL WASTAGE

The burden of repetition and drop-out is explicit in the input/output ratio, previously defined as the relationship 'pupil-years invested/normal duration'. This means that the difference between the derived ratio and 1.00 is the excess in 'cost' (in non-monetary terms), compared with the ideal one. This ratio, complemented by the over-all drop-out in an education system, measures the extent of educational wastage.

With the above concepts in mind, it appears that the incidence in 'cost' of drop-out is much lower if it happens at the beginning of a cycle than at an advanced grade and, similarly, success following repetition leads to a reduction in 'costs'. This introduces some basic notions of cost analysis which allow a better insight into the complex mix of 'wastage' and the relative contribution of its components.

In addition to the two indicators mentioned above, there are three more that can be derived from the method of approach under discussion.

(a) *Percentage of pupil-years spent in excess.* This is the number of pupil years invested *minus* the estimated optimal—on the assumption that the output of the system had not required repetition. For example: the case developed in Diagram 6 shows a total of pupil-years invested of 2,530. The output of 292 successful completers should have spent, under optimum conditions, no more than 876 pupil-years (i.e., 292×3 years). Thus, 1,654 pupil-years were spent in excess or 65 per cent of the total $\frac{1,654}{2.530}$.

(b) *Attribution of the pupil-years spent in excess to (i) graduates, (ii) drop-outs.* This attribution sets out to explain in what proportion the years spent in excess were used by successful completers, through repetition, or by pupils who, ultimately, dropped-out.

Referring back to the example shown in Diagram 6, it is seen that pupils completing the cycle did so in 3 years (113 of them), or 4 years (99 of them), or 5 years (80 of them). This means that:

113 completed the cycle in time		—
99 required 1 extra year	=	99
80 required 2 extra years	=	160
Thus the number of extra years due to them was:		259

In other words, 259 pupil-years are attributable to graduates, or 15.7 per cent of the total pupils spent in excess (i.e 259/1,654). The remaining 1,395 years, (1,654 – 259) or 84.3 per cent are therefore attributable to unsuccessful repetition.

(c) *Places absorbed by drop-outs, but effective (i.e. leading to promotion).* The purpose of this calculation is to stress the relative benefit accruing from a proportion of the places occupied by drop-outs who left school after having been promoted at some stage. It can be seen from the drop-out profile at the bottom of Diagram 6, that 242 pupils dropped-out after promotion to grade 2, and thus 1 year can be considered effective for them; 108 pupils dropped-out after promotion to grade 3, thus 2 years can be considered effective. In this case 458 years (i.e. 242×1, plus 108×2) or 32.8 per cent of the 1,395 years spent in excess were effective.

The interest presented by the analysis of an education system as described above is considerably increased if, in addition to the aggregate national data, detailed statistical data within a country (for instance, by zones) are compiled and analysed, thus high-lighting the main flow features and identifying those sectors or areas where the education system is less efficient.

In this connection, the following chapter will develop a case study on Colombia (from 1960 to 1968 inclusive) with detailed information for urban and rural zones.

NOTE. *Example of comparative results by 'apparent cohort' and 'reconstructed cohort' analysis.*

Meaningful analysis of wastage must produce quite separate profiles for both drop-out and repetition. The point can be illustrated very simply. If one takes data—say for first stage of first level education in Thailand—and applies an 'apparent cohort' analysis, i.e. comparing enrolment in grade 1 in a particular year with enrolment in successive grades during successive years (thus assuming that the decrease from each grade to the next equals 'wastage'), the result would normally be very different from an analysis aiming at the measurement of drop-out and the 'recuperation' by the school system of a part of the repeaters who will succeed in subsequent years, i.e., by *reconstructing the cohort.* Such and analysis would appear as follows:

Thailand
First stage, first level: cohort starting in 1963/64.

Successive grades in successive years	'Apparent cohort'	Estimated drop-out	Cohort with repetition-reconstruction of ultimate transition	Estimated drop-out
1	1 000	170	1 000	122
2	830	50	878	27
3	780	93	851	30
4	687	—	821	—
Total		313		179

It can be seen that without taking repetition into account, the conclusion reached is that out of every 1,000 pupils entering grade 1, only 687 appear to reach grade 4, which would mean a 31.3 per cent drop-out. Whereas when taking into account the fact that many of the pupils on their way to grade 4 repeat grades, often more than once, it is found that out of 1,000 pupils entering grade 1, there are 821 who *eventually* reach grade 4, i.e., an over-all drop-out rate of 17.9 per cent, or slightly more than half the rate given by the 'apparent cohort' analysis.

Chapter four

A case study evaluating educational wastage : Colombia (1960-68)

The purpose of this chapter is to present a summary of a study, using real data with a view to demonstrating the operational aspects of the methodology developed in the previous chapter.

Three other countries—one from each of the major regions—selected because of their typical features of efficiency, will be studied in Appendix II, following the same pattern and thus providing an empirical verification of the somewhat more theoretical developments of previous chapters.

The procedure includes five main steps: (i) data; (ii) rates; (iii) flow of pupils; (iv) reconstruction of the cohort; (v) analysis of efficiency. Two supplementary stages are successively introduced, namely, the separate study by sex and by zones within the country (urban and rural), the interest of which self-evident.

DATA

Tables 6 and 7 below contain the statistical data on enrolment and repeaters by grade from 1960 to 1968 for the five grades of first level education in the country for boys and girls, and girls only, respectively.

By following the steps indicated in Chapter 3, it is very easy to derive the relevant rates from Tables 6 and 7. Thus, for instance, the rates for grade 1 in 1960 (i.e. 778,914 pupils) can be estimated as follows:

		Rates
(a)	Pupils repeating grade 1 in 1961 = 209,045	r = .268
(b)	Pupils promoted to grade 2 in 1961, i.e. enrolled minus repeaters (468,580 − 110,051) = 358,529	p = .460
(c)	Complement of (a) + (b) to make total enrolment in 1960 in grade 1 (or 778,914 − (209,045 + 358,529) = 211,340	d = .272
	778,914	1.000

Table 6
Enrolment by grade at the first level of education (girls and boys)

Year and category	Total all grades	Grade				
		1	2	3	4	5
1960						
Enrolment	1 690 361	778 914	448 744	224 197	142 259	96 247
of which repeaters	367 808	200 174	106 024	34 300	17 039	10 271
1961						
Enrolment	1 791 813	810 441	468 580	241 298	158 398	113 096
of which repeaters	388 070	209 045	110 051	38 177	18 861	11 936
1962						
Enrolment	1 948 772	863 602	506 274	269 718	178 909	130 269
of which repeaters	408 088	218 029	114 066	41 720	20 778	13 495
1963						
Enrolment	2 096 408	910 099	539 030	298 145	201 271	147 863
of which repeaters	430 375	226 221	121 231	45 193	23 311	14 419
1964						
Enrolment	2 213 423	936 972	561 748	327 012	221 251	166 440
of which repeaters	443 711	233 350	119 586	48 899	25 440	16 436
1965						
Enrolment	2 274 014	922 056	574 162	349 324	244 309	184 163
of which repeaters	431 289	227 672	116 264	47 889	24 380	15 084
1966						
Enrolment	2 402 030	949 341	592 152	379 930	272 547	208 060
of which repeaters	447 537	231 247	118 252	52 955	27 851	17 232
1967						
Enrolment	2 586 288	1 019 967	628 069	408 427	298 992	230 833
of which repeaters	482 400	246 532	125 036	58 811	32 592	19 429
1968						
Enrolment	2 733 432	1 056 066	659 476	449 154	317 862	250 874
of which repeaters	484 884	244 402	118 862	64 053	35 112	22 455

Tables 8 and 9 present this type of computation (for all pupils and girls only, respectively) derived from Tables 6 and 7.

It will be seen that the left-hand side of Tables 8 and 9 reproduces the movement of pupils in each grade with respect to the following school year, in the same way as has been developed for grade 1 in 1960. The right-hand side of the tables reflects the corresponding rates or, in practical terms, the percentage distribution. By placing the number of pupils who repeated, were promoted or dropped out, in each column the rates can easily be obtained by

Table 7
Enrolment by grade at the first level of education (girls only)

Year and category	Total all grades	Grade 1	2	3	4	5
1960						
Enrolment	842 691	380 506	226 467	113 745	71 978	49 995
of which repeaters	178 992	94 698	53 387	17 125	8 557	5 225
1961						
Enrolment	888 377	394 948	235 166	121 434	80 118	56 711
of which repeaters	187 332	98 435	55 162	18 664	9 175	5 896
1962						
Enrolment	970 518	424 491	254 392	136 132	89 600	65 903
of which repeaters	198 695	103 941	57 161	20 555	10 234	6 804
1963						
Enrolment	1 040 397	443 372	272 271	149 872	100 559	74 323
of which repeaters	206 237	106 470	59 977	22 140	10 969	6 681
1964						
Enrolment	1 105 380	461 698	283 875	164 622	111 720	83 465
of which repeaters	214 500	110 728	60 060	23 584	12 480	7 648
1965						
Enrolment	1 146 168	460 003	292 535	177 329	123 645	92 656
of which repeaters	210 869	109 341	58 384	23 664	12 080	7 400
1966						
Enrolment	1 207 504	472 697	300 294	192 750	136 990	104 773
of which repeaters	219 526	110 439	60 119	26 802	13 867	8 299
1967						
Enrolment	1 296 105	504 026	318 592	206 522	150 761	116 204
of which repeaters	234 601	116 980	62 610	29 335	16 303	9 373
1968						
Enrolment	1 369 497	518 993	334 296	228 046	160 923	127 239
of which repeaters	234 608	116 179	59 428	31 248	17 385	10 368

dividing each item by the enrolment in that grade. Thus, taking as an example grade 1 in 1960 the result is as follows:

$$\text{Rate of repetition} = \frac{209\,045}{778\,914} = .268 \text{ or } 26.8 \text{ per cent}$$

$$\text{Rate of promotion} = \frac{358\,529}{778\,914} = .460 \text{ or } 46.0 \text{ per cent}$$

$$\text{Rate of drop-out} = \frac{211\,340}{778\,914} = .272 \text{ or } 27.2 \text{ per cent}$$

Table 8
Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (urban and rural, girls and boys)

	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
1960										
Enrolment	778 914	448 744	224 197	142 259	96 247					
Repeaters	209 045	110 051	38 177	18 861	11 936	258	245	170	133	124
Promoted	358 529	203 121	139 537	101 160	* 75 916	460	453	622	711	789
Drop-outs	211 340	135 572	46 483	22 238	8 395	272	302	208	156	87
1961										
Enrolment	810 441	468 580	241 298	158 398	113 096					
Repeaters	218 029	114 066	41 720	20 778	13 495	269	243	173	131	119
Promoted	392 208	227 998	158 131	116 774	* 85 663	484	487	655	737	758
Drop-outs	200 204	126 516	41 447	20 846	13 938	247	270	172	132	123
1962										
Enrolment	863 602	506 274	269 718	178 909	130 269					
Repeaters	226 221	121 231	45 193	23 311	14 419	262	239	168	130	111
Promoted	417 799	252 952	177 960	133 444	* 97 782	484	500	660	746	750
Drop-outs	219 582	132 091	46 565	22 154	18 068	254	261	172	124	139
1963										
Enrolment	910 099	539 030	298 145	201 271	147 863					
Repeaters	233 350	119 586	48 899	25 440	16 436	256	222	164	126	111
Promoted	442 162	278 113	195 811	150 004	* 107 752	486	516	657	745	742
Drop-outs	234 587	141 331	53 435	25 827	21 675	258	262	179	129	146
1964										
Enrolment	936 972	561 748	327 012	221 251	166 440					
Repeaters	227 672	116 264	47 889	24 380	15 084	243	207	146	110	91
Promoted	457 898	301 435	219 749	169 079	* 129 211	489	537	672	764	776
Drop-outs	251 402	144 049	59 374	27 792	22 145	268	256	182	126	133
1965										
Enrolment	922 056	574 162	349 324	244 309	184 163					
Repeaters	231 247	118 072	52 955	27 851	17 232	251	206	152	114	94
Promoted	474 080	326 977	244 696	190 829	* 147 193	514	569	700	782	799
Drop-outs	216 729	129 113	51 673	25 629	19 738	235	225	148	104	107
1966										
Enrolment	949 341	592 152	379 930	272 547	208 060					
Repeaters	246 532	125 036	58 811	32 592	19 429	259	212	155	120	93
Promoted	503 033	349 616	266 400	211 404	* 164 973	530	590	701	776	793
Drop-outs	199 786	117 500	54 719	28 551	23 658	211	198	144	104	114
1967										
Enrolment	1 019 967	628 069	408 427	298 992	230 833					
Repeaters	244 402	118 862	64 053	35 112	22 455	240	189	157	117	97
Promoted	540 614	385 101	282 750	228 419	* 185 702	530	613	692	764	804
Drop-outs	234 951	124 106	61 624	35 461	22 676	230	198	151	119	98
1968										
Enrolment	1 056 066	659 476	449 154	317 862	250 874					

* Reported as successfully passing the final examination.

Table 9
Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (urban and rural, girls only)

	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
1960										
Enrolment	380 506	226 467	113 745	71 978	49 995					
Repeaters	98 435	55 162	18 664	9 175	5 896	259	244	164	127	118
Promoted	180 004	102 770	70 943	50 815	* 37 562	473	454	624	706	751
Drop-outs	102 067	68 535	24 138	11 988	6 537	268	302	212	167	131
1961										
Enrolment	394 948	235 166	121 434	80 118	56 711					
Repeaters	103 941	57 161	20 555	10 234	6 804	263	243	169	128	120
Promoted	197 231	115 577	79 366	59 096	* 43 476	499	491	654	738	767
Drop-outs	93 776	62 428	21 513	10 788	6 431	238	266	177	134	113
1962										
Enrolment	424 491	254 392	136 132	89 600	65 903					
Repeaters	106 470	59 977	22 140	10 969	6 681	251	236	163	122	101
Promoted	212 294	127 732	89 590	67 642	* 49 490	500	502	658	755	751
Drop-outs	105 727	66 683	24 402	10 989	9 732	249	262	179	123	148
1963										
Enrolment	443 372	272 271	149 872	100 559	74 323					
Repeaters	110 728	60 060	23 584	12 480	7 648	250	221	157	124	103
Promoted	223 815	141 038	99 240	75 817	* 56 201	505	518	662	754	756
Drop-outs	108 829	71 173	27 048	12 262	10 474	245	261	181	122	141
1964										
Enrolment	461 698	283 875	164 622	111 720	83 465					
Repeaters	109 341	58 384	23 664	12 080	7 400	237	206	144	108	89
Promoted	234 151	153 665	111 385	85 256	* 66 439	507	541	677	763	796
Drop-outs	118 206	71 826	29 573	14 384	9 626	256	253	179	129	115
1965										
Enrolment	460 003	292 535	177 329	123 465	92 656					
Repeaters	110 439	60 119	26 714	13 867	8 299	240	206	151	112	90
Promoted	240 175	166 036	123 123	96 474	* 73 997	522	568	694	781	798
Drop-outs	109 389	66 380	27 048	12 262	10 460	238	226	155	107	'12
1966										
Enrolment	472 697	300 294	192 750	136 990	104 773					
Repeaters	116 980	62 610	29 335	16 303	9 773	247	208	152	119	89
Promoted	255 982	177 187	134 458	106 831	* 84 318	542	590	698	780	805
Drop-outs	99 735	60 497	28 957	13 856	11 082	211	202	150	101	106
1967										
Enrolment	504 026	318 592	206 522	150 761	116 204					
Repeaters	116 179	59 428	31 248	17 385	10 368	231	187	151	115	89
Promoted	275 368	196 798	143 538	116 871	* 94 664	546	618	695	775	815
Drop-outs	112 479	62 366	31 736	16 505	11 172	223	195	154	110	96
1968										
Enrolment	518 993	334 796	228 046	160 923	127 239					

* Reported as successfully passing the final examination.

It should be noted that, for the last grade, information on pupils having successfully passed the examinations in 1967 and 1968 is used to estimate the number of pupils dropping out of the school. In practical terms, taking 1967 and 1968 as examples, the computations are as follows:

Pupils enrolled in grade 5 in 1967 (see Table 6) = 230,833.
Pupils repeating grade 5 in 1968 = 22,455.
Pupils passing the final examination in 1967 = 185,702.

Thus:	Enrolment in grade 5 in 1967
Repeaters in 1968 = 22,455	230,833
Passing the examination in 1967 = 185,702	208,157
Drop-outs	22,676

The pupils who neither passed the examination nor came back as repeaters the following year are thus registered as 'drop-outs', with all the reservations stated in Chapter 3.

FLOW OF PUPILS

The actual flow of pupils from 1960 to 1968 inclusive is shown in Diagrams 10 and 11 (for total enrolment and girls only, respectively). These diagrams provide a very interesting picture of the expansion of the education system at each grade, net intake of newcomers and, more important, the yearly movements expressed in rates and their developments. These two diagrams call attention to the following facts:

The participation of girls at school in Colombia represents an almost constant proportion—50 per cent or so of the total enrolment during the period under review—and does not show much change at any grade.

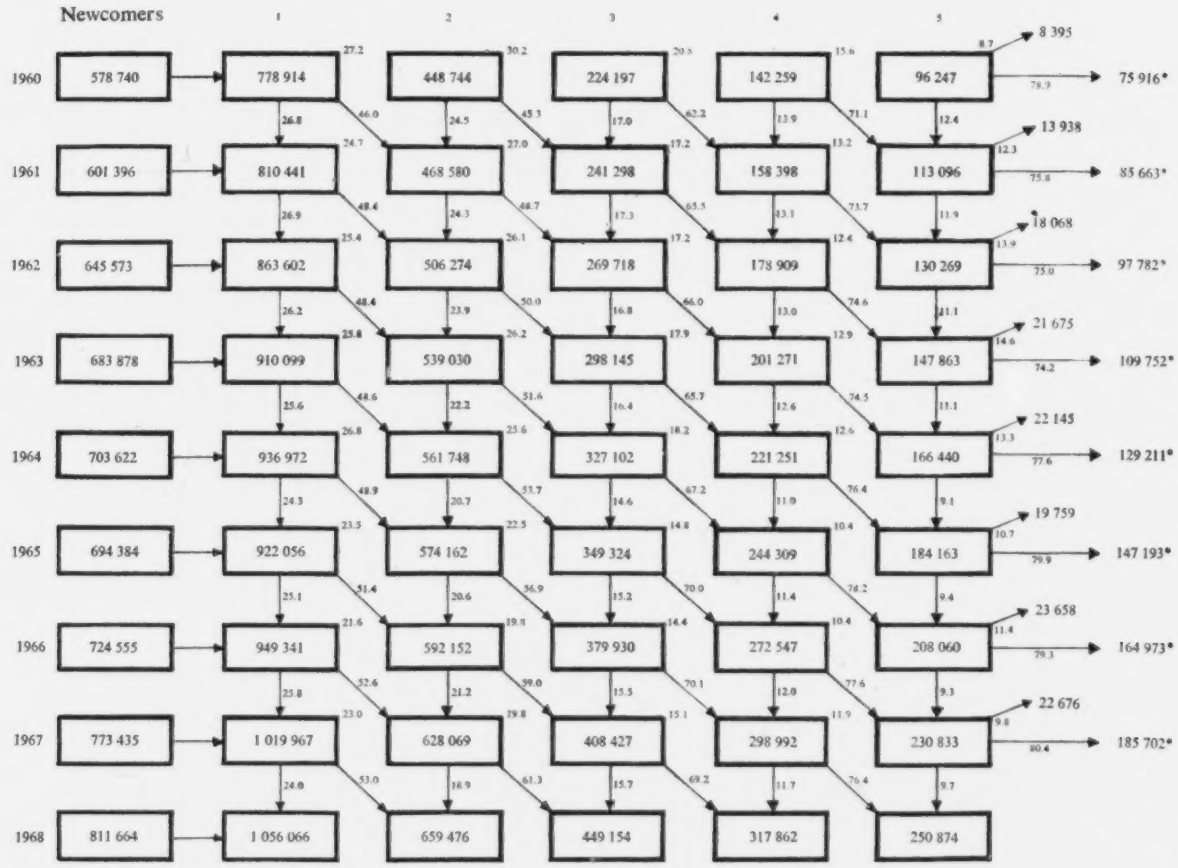
The rates of repetition, promotion and drop-out are also very similar for total enrolment and girls only.

There is a trend towards improvement of promotion rates, but in the first two grades repetition represents between 27 and 23 per cent and drop-out between 27 and 22 per cent.

RECONSTRUCTION OF THE COHORT

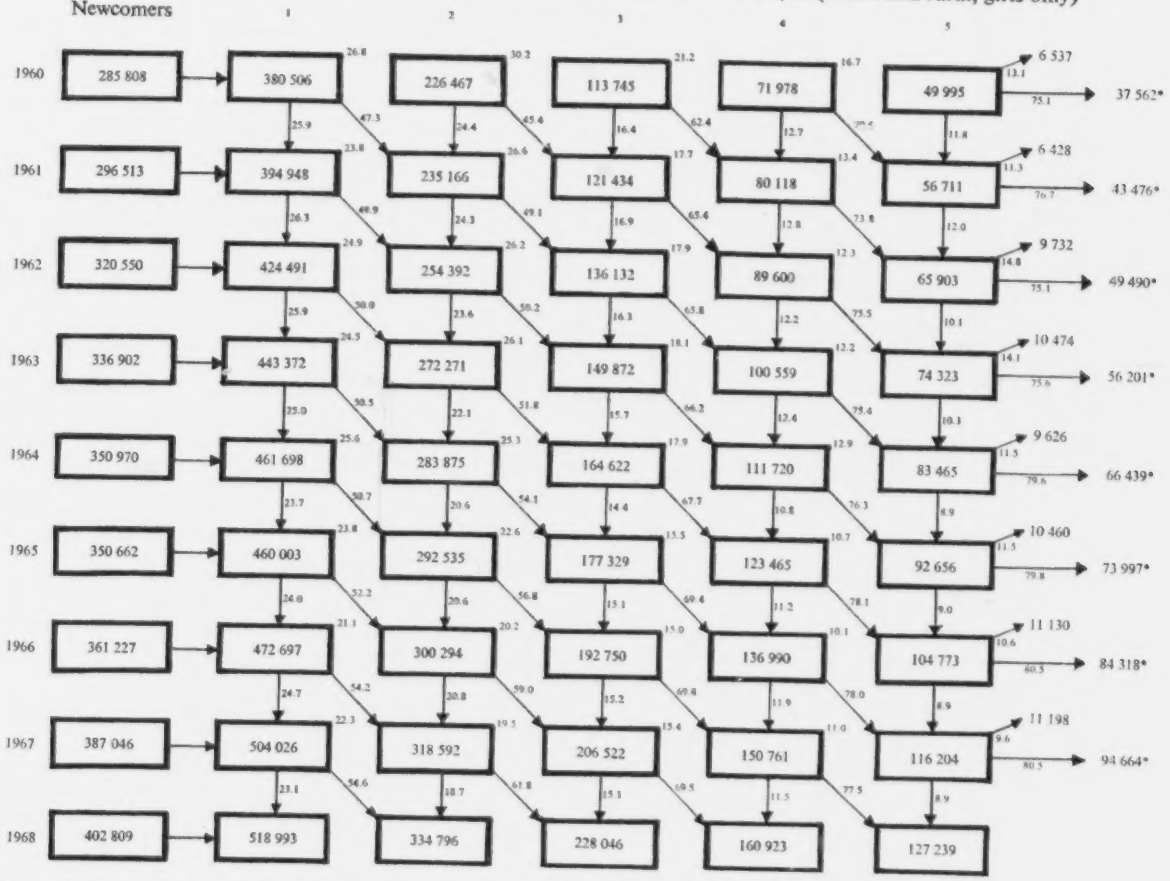
Following the method explained in Chapter 3, i.e. by the successive application of each rate observed, we can establish the flow diagrams (Diagram 12 for total enrolment, and Diagram 13 for girls only).

Diagram 10. Actual flow of pupils through first level of education, 1960/61 to 1967/68 (urban and rural, girls and boys)



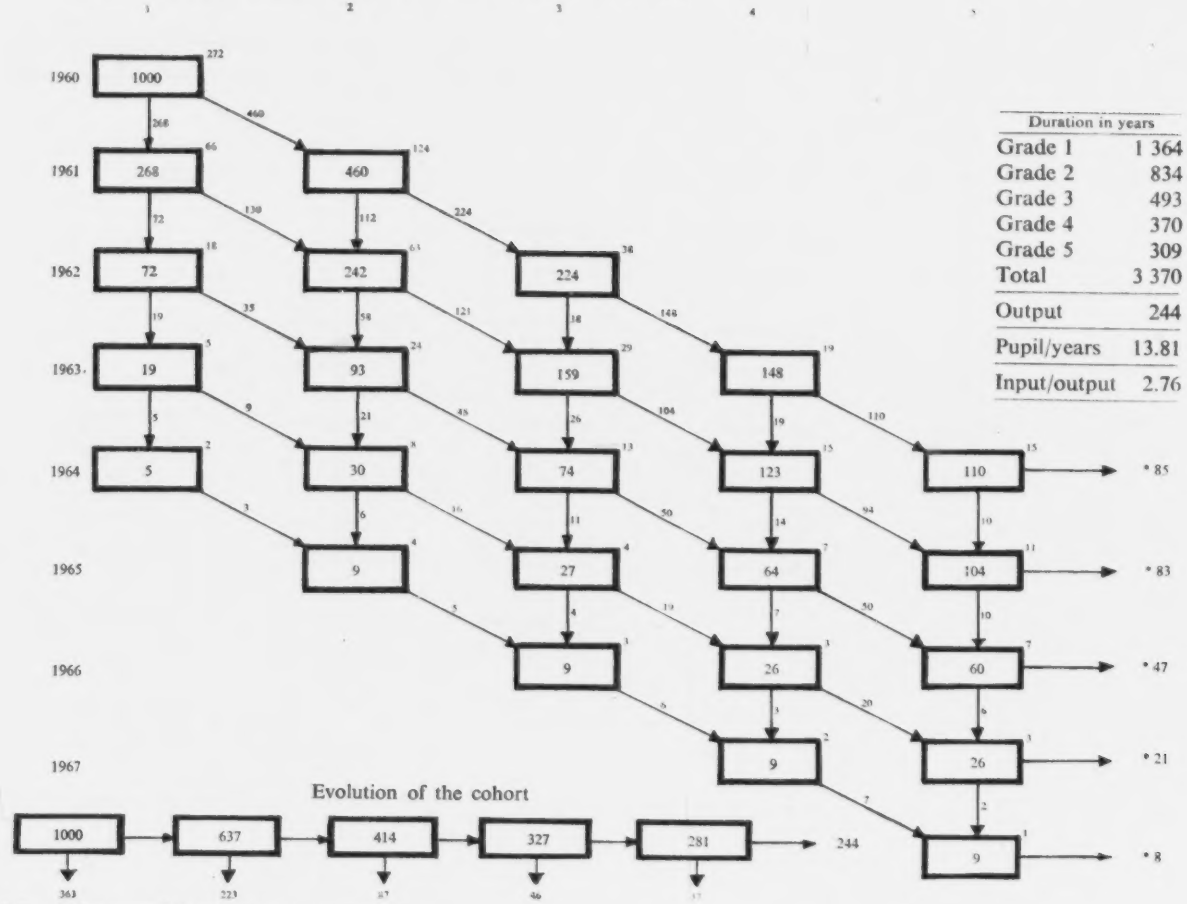
* Reported as successfully passing the final examination

Diagram 11. Actual flow of pupils through first level of education, 1960/61 to 1967/68 (urban and rural, girls only)



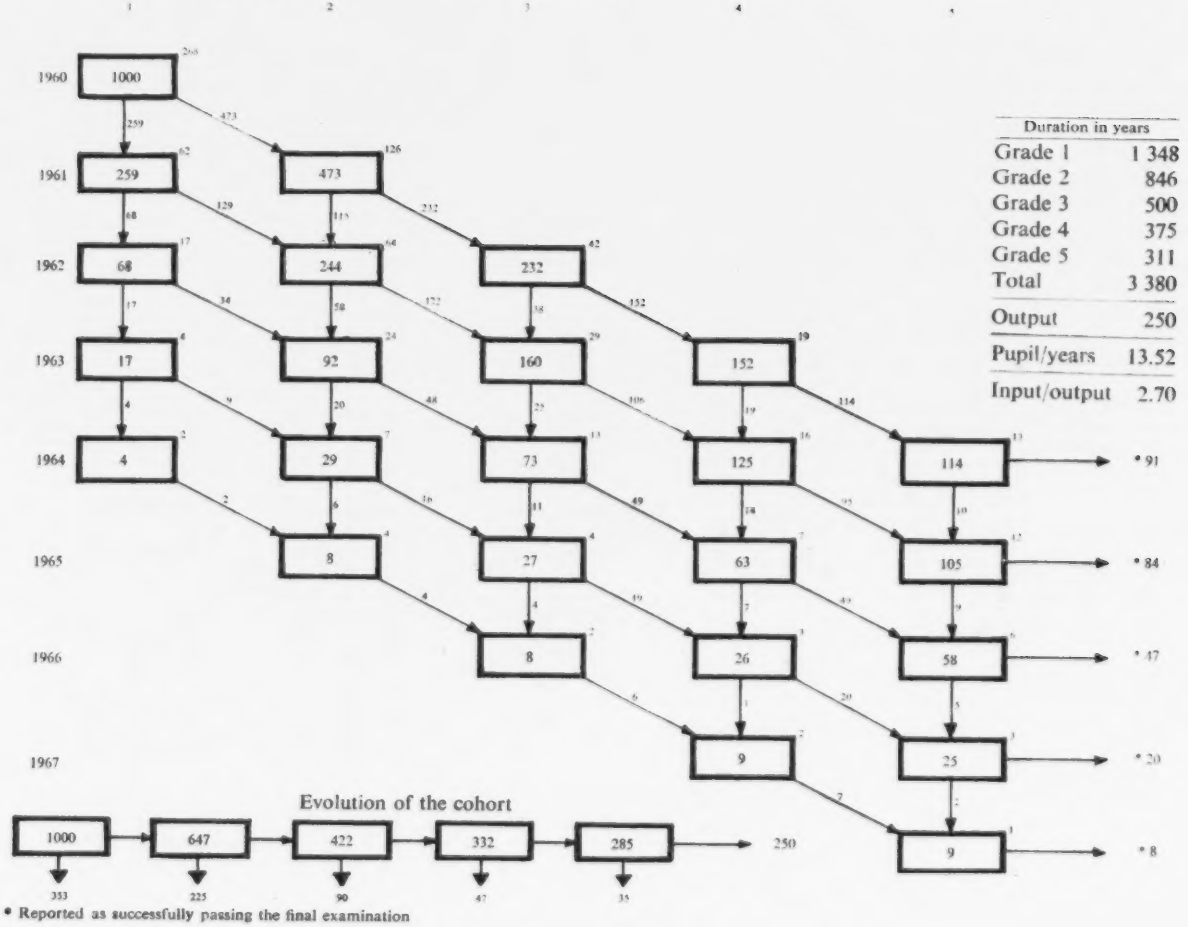
* Reported as successfully passing the final examination

Diagram 12. First level of education (urban and rural, girls and boys)



* Reported as successfully passing the final examination

Diagram 13. First level of education (urban and rural, girls only)



Duration in years	
Grade 1	1 348
Grade 2	846
Grade 3	500
Grade 4	375
Grade 5	311
Total	3 380
Output	250
Pupil/years	13.52
Input/output	2.70

* Reported as successfully passing the final examination

ANALYSIS OF EFFICIENCY

Because of the very similar pattern shown by the rates, Diagrams 12 and 13 lead to very similar results. This is shown on a summary basis, highlighting some of the major features, which can be defined as indicators of wastage.

	Total	Girls only
(i) *Input/output ratio:*	2.76	2.70
(ii) *Overall drop-out:*	76.6%	75.0%

It can be seen that only one out of four pupils entering first level education completed the cycle successfully, but that the education system invested 170 per cent more than the resources minimally required. No significant difference existed between girls and boys:

(iii) *Output by number of repeating years:*

Years repeated	Output			
	total	%	girls	%
0	85	34.8	91	36.4
1	83	34.0	84	33.6
2	47	19.3	47	18.8
3	21	8.6	20	8.0
4	8	3.3	8	3.2
Total	244	100.0	250	100.0

Slightly over one-third of the pupils completing the cycle did so without repeating, another third repeated one year and the remainder repeated from two to four years.

(iv) *Promotion and drop-out profiles:*

Grades	Promotion (grade 1 = 1,000)		Drop-out	
	total	girls	total	girls
1	1 000	1 000	363	353
2	637	647	223	225
3	414	422	87	90
4	327	332	46	47
5	281	285	37	35
Total	244	250	756 (all grades)	750 (all grades)

(v) *Percentage of transition from grade to grade* (i.e. result of dividing the promotion profile at each grade by the previous one):

Grades	Total	Girls
1	63.7	64.7
2	65.0	65.2
3	79.0	78.7
4	85.9	85.8
5	86.8	87.7

The incidence of drop-out in the first two grades is thus identified.

(vi) *Percentage of pupil-years spent in excess:*

	Total	Girls
Optimum pupil-years to be invested		
Total (244 × 5) =	1 220	
Girls (250 × 5) =		1 250
Total invested	3 370	3 380
Excess	2 150	2 130
Percentage of the total invested	63.8	63.0

(vii) *Attribution of the pupil-years spent in excess:* [1]

	Total	Girls
Pupil-years spent in excess	2150	2130
Attributable to:		
(a) Graduates	272 (12.7%)	270 (12.7%)
(b) Drop-outs	1 878 (87.3%)	1 860 (87.3%)

(viii) *Places absorbed by drop-outs, but effective (i.e. leading to promotion):*

Total 683 years (223 × 1; 87 × 2; 46 × 3; and 37 × 4) or 36.4% of the years attributable to drop-outs.

Girls 686 years (225 × 1; 90 × 2; 47 × 3; and 35 × 4) or 36.9% of the years attributable to drop-outs.

1. See Chapter 3 for an explanation of computational steps.

URBAN/RURAL PATTERNS OF WASTAGE

The interest presented by the indicators computed above is considerably increased if, in addition to the aggregate national data, statistics by zones can be compiled and analysed within a country, thus highlighting the main flow features and identifying those sectors or areas where the education system is less efficient. Included below are the main lines of the urban/rural patterns of wastage in first level education in Colombia.

The information available for urban and rural zones separately covered the period 1960 to 1966 inclusive, thus allowing for the reconstruction of a cohort. Tables 10 and 11 reproduce the relevant data for urban and rural zones respectively. The same information for girls only is presented in Tables 12 and 13.

Table 10
Enrolment by grade at the first level of education (urban, girls and boys)

Year and category	Total all grades	Grade				
		1	2	3	4	5
1960						
Enrolment	1 050 997	372 955	256 754	193 657	133 833	93 798
of which repeaters	175 217	73 491	47 264	28 599	15 899	9 964
1961						
Enrolment	1 128 039	391 174	271 528	207 324	148 215	109 798
of which repeaters	189 610	78 788	49 853	32 054	17 435	11 408
1962						
Enrolment	1 232 393	419 111	292 882	229 181	165 582	125 637
of which repeaters	200 364	81 879	51 828	34 580	19 077	13 000
1963						
Enrolment	1 314 635	438 881	308 518	244 444	182 572	140 220
of which repeaters	209 174	83 536	55 405	35 650	20 917	13 666
1964						
Enrolment	1 400 273	457 929	325 415	263 840	197 145	155 944
of which repeaters	221 800	87 978	56 534	39 233	22 748	15 307
1965						
Enrolment	1 461 648	456 200	338 721	278 644	216 672	171 411
of which repeaters	217 675	88 945	55 957	37 452	21 487	13 834
1966						
Enrolment	1 575 304	483 362	353 745	303 695	241 022	193 480
of which repeaters	231 899	92 086	57 957	41 280	24 672	15 904

Table 11. Enrolment by grade at the first level of education (rural, girls and boys)

Year and category	Total all grades	Grade 1	2	3	4	5
1960						
Enrolment	639 364	405 959	191 990	30 540	8 426	2 449
of which repeaters	192 591	126 683	58 760	5 701	1 140	307
1961						
Enrolment	663 774	419 267	197 052	33 974	10 183	3 298
of which repeaters	198 460	130 257	60 198	6 123	1 426	456
1962						
Enrolment	716 379	444 491	213 392	40 537	13 327	4 632
of which repeaters	207 724	136 150	62 238	7 140	1 701	495
1963						
Enrolment	781 773	471 218	230 512	53 701	18 699	7 643
of which repeaters	221 201	142 685	65 826	9 543	2 394	753
1964						
Enrolment	813 150	479 043	236 333	63 172	24 106	10 496
of which repeaters	221 911	145 372	63 052	9 666	2 692	1 129
1965						
Enrolment	812 366	465 856	235 441	70 680	27 637	12 752
of which repeaters	213 614	138 727	60 307	10 437	2 893	1 250
1966						
Enrolment	826 726	465 979	238 407	76 235	31 525	14 580
of which repeaters	215 638	139 161	60 295	11 675	3 179	1 328

Table 12. Enrolment by grade at the first level of education (urban, girls only)

Year and category	Total all grades	Grade 1	2	3	4	5
1960						
Enrolment	534 345	187 388	131 311	98 799	67 969	48 878
of which repeaters	87 159	35 443	24 216	14 423	7 998	5 079
1961						
Enrolment	570 887	196 935	138 770	104 901	75 083	55 198
of which repeaters	93 233	38 085	25 321	15 706	8 448	5 673
1962						
Enrolment	625 191	212 303	149 370	116 401	83 420	63 697
of which repeaters	99 659	40 352	26 219	17 045	9 465	6 578
1963						
Enrolment	664 010	219 283	157 922	123 905	92 021	70 879
of which repeaters	100 496	40 184	27 015	17 133	9 877	6 287
1964						
Enrolment	714 869	233 425	167 224	134 708	100 505	79 007
of which repeaters	109 040	43 266	28 455	18 944	11 224	7 151
1965						
Enrolment	750 475	235 460	174 616	142 927	110 542	86 930
of which repeaters	108 316	43 910	28 383	18 544	10 646	6 833
1966						
Enrolment	807 193	248 089	182 467	155 994	122 316	98 327
of which repeaters	115 942	45 251	29 742	20 968	12 347	7 634

Table 13
Enrolment by grade at the first level of education (rural, girls only)

Year and category	Total all grades	Grade 1	2	3	4	5
1960						
Enrolment	308 346	193 118	95 156	14 946	4 009	1 117
of which repeaters	91 833	59 255	29 171	2 702	559	146
1961						
Enrolment	317 490	198 013	96 396	16 533	5 035	1 513
of which repeaters	94 099	60 350	29 841	2 958	727	223
1962						
Enrolment	345 327	212 188	105 022	19 731	6 180	2 206
of which repeaters	99 036	63 589	30 942	3 510	769	226
1963						
Enrolment	376 387	224 089	114 349	25 967	8 538	3 444
of which repeaters	105 741	66 286	32 962	5 007	1 092	394
1964						
Enrolment	390 511	228 273	116 651	29 914	11 215	4 458
of which repeaters	105 460	67 462	31 605	4 640	1 256	497
1965						
Enrolment	395 693	224 543	117 919	34 402	13 013	5 726
of which repeaters	102 553	65 431	30 001	5 120	1 434	567
1966						
Enrolment	399 280	223 577	117 827	36 756	14 674	6 446
of which repeaters	103 584	65 188	30 377	5 834	1 520	665

These tables show quite a difference in the pattern of school participation. The trends seem to be towards a faster expansion of urban than of rural schools. This can be seen from the following:

	Percentage distribution of enrolment		
	total	urban zones	rural zones
Total for Colombia			
1960	100	62.2	37.8
1966	100	65.6	34.4
Girls only			
1960	100	63.4	36.6
1966	100	66.9	33.1

The relative importance of each grade is shown below and it is seen that there is an unusual concentration in grades 1 and 2 in rural zones (93.5 per cent in 1960 and 85.2 per cent in 1966) which was very similar in the case of girls (93.5 per cent in 1960 and 85.6 per cent in 1966). The actual capacity of schools was the explanation found for this, as will be shown later. The close pattern of girls to total enrolment is also shown by these percentages.

	Grades				
	1	2	3	4	5
Urban zones					
1960	35.5	24.4	18.4	12.8	8.9
1966	30.7	22.5	19.3	15.3	12.2
Girls					
1960	35.1	24.6	18.5	12.7	9.1
1966	30.7	22.6	19.3	15.2	12.2
Rural zones					
1960	63.5	30.0	4.8	1.3	0.4
1966	56.4	28.8	9.2	3.8	1.8
Girls					
1960	62.7	30.8	4.8	1.3	0.4
1966	56.0	29.6	9.2	3.6	1.6

The heavier effect of repetition in rural as opposed to urban zones is shown by the data given below. Thus, it can be seen that in 1966 the girls enrolled in rural zones (who represented 33.1 per cent of the total enrolment in the country) included 47.2 per cent of the country's repeaters.

	Percentage distribution of repeaters		
	total	urban zones	rural zones
Total Colombia			
1960	100	47.6	52.4
1966	100	51.8	48.2
Girls			
1960	100	48.7	51.3
1966	100	52.8	47.2

Tables 14-17 present the rates of repetition, promotion and drop-out as derived for urban and rural zones separately and also for girls in these zones. Again, the movement of girls seems to follow over-all movement very closely.

Table 14
Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (urban, girls and boys)

	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
1960										
Enrolment	372 955	256 754	193 657	133 833	93 798					
Repeaters	78 788	49 853	32 054	17 435	11 480	211	194	166	130	122
Promoted	221 675	175 270	130 780	93 318	82 318	594	683	675	735	878
Drop-outs	72 492	31 631	30 823	18 080		195	123	159	135	
1961										
Enrolment	391 174	271 258	207 324	148 215	109 798					
Repeaters	81 879	51 828	34 580	19 077	13 000	209	191	167	129	118
Promoted	241 054	194 601	146 505	112 637	96 798	616	717	707	760	882
Drop-outs	68 241	25 099	26 239	16 501		175	92	126	111	
1962										
Enrolment	419 111	292 882	229 181	165 582	125 637					
Repeaters	83 536	55 405	35 650	20 917	13 666	199	189	156	126	109
Promoted	253 113	208 794	161 655	126 554	111 971	604	713	705	764	891
Drop-outs	82 462	28 683	31 876	18 111		197	98	139	110	
1963										
Enrolment	438 881	308 518	244 444	182 572	140 220					
Repeaters	87 978	56 534	39 233	22 748	15 307	200	183	160	125	109
Promoted	268 881	224 607	174 397	140 637	124 913	613	728	713	770	891
Drop-outs	82 022	27 377	30 814	19 187		187	89	127	105	
1964										
Enrolment	457 929	325 415	263 840	197 145	155 944					
Repeaters	88 945	55 957	37 452	21 487	13 834	194	172	142	109	89
Promoted	282 764	241 192	195 185	157 577	142 110	618	741	740	799	911
Drop-outs	86 220	28 268	31 203	18 081		188	87	118	92	
1965										
Enrolment	456 200	338 721	278 644	216 672	171 411					
Repeaters	92 086	57 957	41 280	24 672	15 904	202	171	148	114	93
Promoted	195 788	262 415	216 350	177 576	155 507	648	775	776	820	907
Drop-outs	68 326	18 349	21 014	14 424		150	54	76	66	
1966										
Enrolment	483 362	353 745	303 695	241 022	193 480					

Table 15
Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (rural, girls and boys)

	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
1960										
Enrolment	405 959	191 990	30 540	8 426	2 449					
Repeaters	130 257	60 198	6 123	1 426	456	321	314	200	169	186
Promoted	136 854	27 851	8 757	2 842	1 993	337	145	287	337	814
Drop-outs	138 848	103 941	15 660	4 158		342	541	513	494	
1961										
Enrolment	419 267	197 052	33 974	10 183	3 298					
Repeaters	136 150	62 238	7 140	1 701	495	325	316	210	167	150
Promoted	151 154	33 397	11 626	4 137	2 803	361	169	342	406	850
Drop-outs	131 963	101 417	15 208	4 345		314	515	448	427	
1962										
Enrolment	444 491	213 392	40 392	13 327	4 632					
Repeaters	142 685	65 826	9 543	2 394	753	321	308	235	180	163
Promoted	164 686	44 158	16 305	6 890	3 879	371	207	402	517	837
Drop-outs	137 120	103 408	14 689	4 043		308	485	363	303	
1963										
Enrolment	471 218	230 512	53 701	18 699	7 643					
Repeaters	145 372	63 052	9 666	2 692	1 129	309	274	180	144	148
Promoted	173 281	53 506	21 414	9 367	6 514	368	232	399	501	852
Drop-outs	152 565	113 954	22 621	6 640		323	494	421	355	
1964										
Enrolment	479 043	236 333	63 172	24 106	10 496					
Repeaters	138 727	60 307	10 437	2 893	1 250	290	255	165	120	119
Promoted	175 134	60 243	24 744	11 502	9 246	366	255	392	477	881
Drop-outs	165 182	115 783	27 991	9 711		344	490	443	403	
1965										
Enrolment	465 856	235 441	70 680	27 637	12 752					
Repeaters	139 161	60 295	11 675	3 179	1 328	299	256	165	115	104
Promoted	178 112	64 566	28 346	13 252	11 424	382	274	401	480	896
Drop-outs	148 583	110 586	30 659	11 206		319	470	434	405	
1966										
Enrolment	465 979	238 407	76 235	31 525	44 580					

Table 16
Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (urban, girls only)

	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
1960										
Enrolment	187 388	131 311	98 799	67 969	48 878					
Repeaters	38 085	25 321	15 706	8 448	5 673	203	193	159	124	116
Promoted	113 449	89 195	66 635	49 525	43 205	605	679	674	729	884
Drop-outs	35 854	16 795	16 458	9 996		192	128	167	147	
1961										
Enrolment	196 935	138 770	104 901	75 083	55 198					
Repeaters	40 352	26 219	17 045	9 465	6 578	205	189	162	126	119
Promoted	123 151	99 356	73 955	57 119	48 620	625	716	705	761	88
Drop-outs	33 432	13 195	13 901	8 499		170	95	133	113	
1962										
Enrolment	212 303	149 370	116 401	83 420	63 697					
Repeaters	40 184	27 015	17 133	9 877	6 287	189	181	147	118	99
Promoted	130 907	106 772	82 144	64 592	57 410	617	715	706	774	901
Drop-outs	41 212	15 583	17 124	8 951		194	104	147	108	
1963										
Enrolment	219 283	157 992	123 905	92 021	70 879					
Repeaters	43 266	28 455	18 944	11 224	7 151	197	180	153	122	101
Promoted	138 769	115 764	89 281	71 856	63 728	633	733	721	781	899
Drop-outs	37 248	13 703	15 680	8 941		170	87	126	97	
1964										
Enrolment	233 425	167 224	134 708	100 505	79 007					
Repeaters	43 910	28 383	18 544	10 646	6 833	188	170	138	106	86
Promoted	146 233	124 383	99 896	80 097	72 174	626	744	742	797	914
Drop-outs	43 282	14 458	16 268	9 762		186	86	120	97	
1965										
Enrolment	235 460	174 616	142 927	110 542	86 930					
Repeaters	45 251	29 742	20 968	12 347	7 634	192	170	147	112	88
Promoted	152 725	135 026	109 969	9 693	72 296	649	773	769	820	912
Drop-outs	37 484	9 848	11 990	7 502		159	57	84	68	
1966										
Enrolment	248 089	182 467	155 994	122 316	98 327					

Table 17
Enrolment, repeaters, promoted and drop-outs, at the first level of education and adjusted rates (rural, girls only)

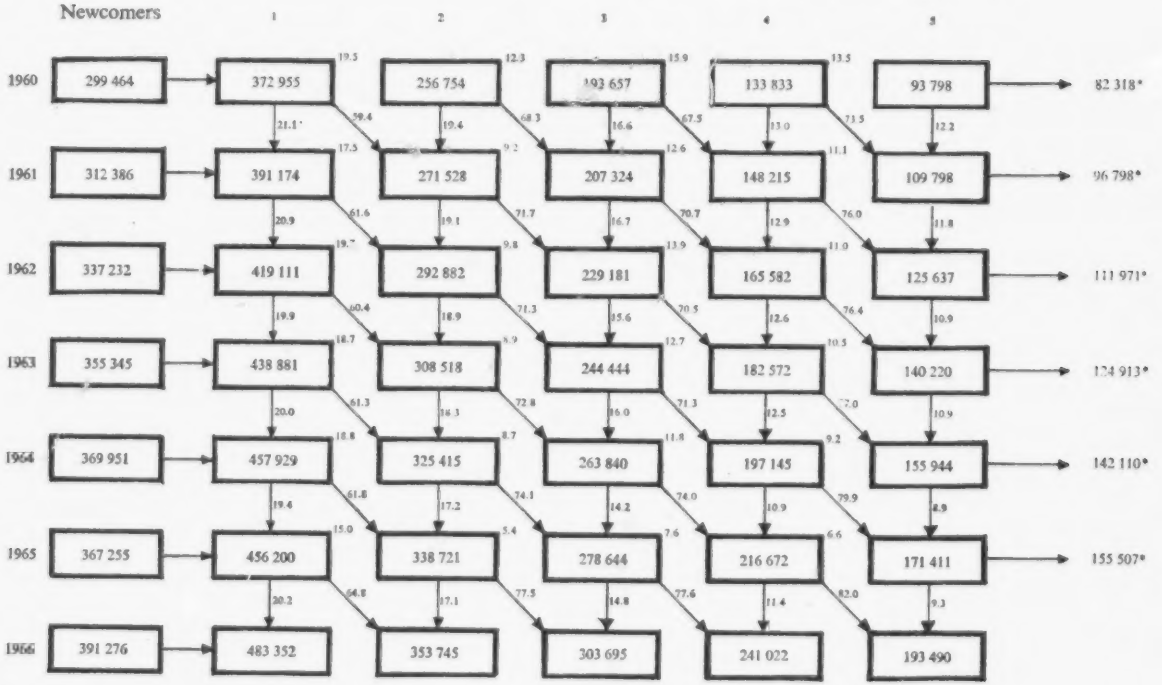
	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
1960										
Enrolment	193 118	95 156	14 946	4 009	1 117					
Repeaters	60 350	29 841	2 958	727	223	313	314	198	181	200
Promoted	66 555	13 575	4 308	1 290	894	345	143	288	322	800
Drop-outs	66 213	51 740	7 680	1 992		342	543	514	497	
1961										
Enrolment	198 013	96 396	16 533	5 035	1 513					
Repeaters	63 589	30 942	3 510	769	226	321	321	212	153	149
Promoted	74 080	16 221	5 411	1 980	1 287	374	168	327	393	851
Drop-outs	60 344	49 233	7 612	2 286		305	511	461	454	
1962										
Enrolment	212 188	105 022	19 731	6 180	2 206					
Repeaters	66 286	32 962	5 007	1 092	394	312	314	254	177	179
Promoted	81 387	20 960	7 446	3 050	1 812	384	200	377	494	821
Drop-outs	64 515	51 100	7 278	2 038		304	486	369	329	
1963										
Enrolment	224 089	114 349	25 967	8 538	3 444					
Repeaters	67 462	31 605	4 640	1 256	497	301	276	179	147	144
Promoted	85 046	25 274	9 959	3 961	2 947	380	221	384	464	856
Drop-outs	71 581	57 470	11 368	3 321		319	503	437	389	
1964										
Enrolment	228 273	116 651	29 914	11 215	4 458					
Repeaters	65 431	30 001	5 120	1 434	567	287	257	171	128	127
Promoted	87 918	29 282	11 579	5 159	3 891	385	251	387	460	873
Drop-outs	74 924	57 368	13 215	4 622		328	492	442	412	
1965										
Enrolment	224 543	117 919	34 402	13 013	5 726					
Repeaters	65 188	30 377	5 834	1 520	665	290	258	170	117	116
Promoted	87 450	30 922	13 154	5 781	5 061	390	262	382	444	884
Drop-outs	71 905	56 620	15 414	5 712		320	480	448	439	
1966										
Enrolment	223 577	117 827	36 756	14 674	6 446					

Diagrams 14 to 17 reproduce the actual flow of pupils by zone and sex from 1960 to 1966. The considerable weight of repetition and drop-out in rural zones is shown. It can be seen that the trend is towards a reduction of these factors of wastage and, consequently, an increase in promotion. However the relative importance of this trend is still rather slight, as can be seen from the following:

	Grades			
	1 to 2	2 to 3	3 to 4	4 to 5
Urban zones				
1960/61	59.4	68.3	67.5	73.5
1965/66	64.8	77.5	77.6	82.0
Rural zones				
1960/61	33.7	14.5	28.7	33.7
1965/66	38.2	27.4	40.1	48.0

The reconstruction of the cohorts will allow an estimation of the efficiency of the education system with details by zone and sex (see Diagrams 18 to 21).

Diagram 14. Actual flow of pupils through first level of education, 1960/61 to 1965/66 (urban, girls and boys)



* Reported as successfully passing the final examination

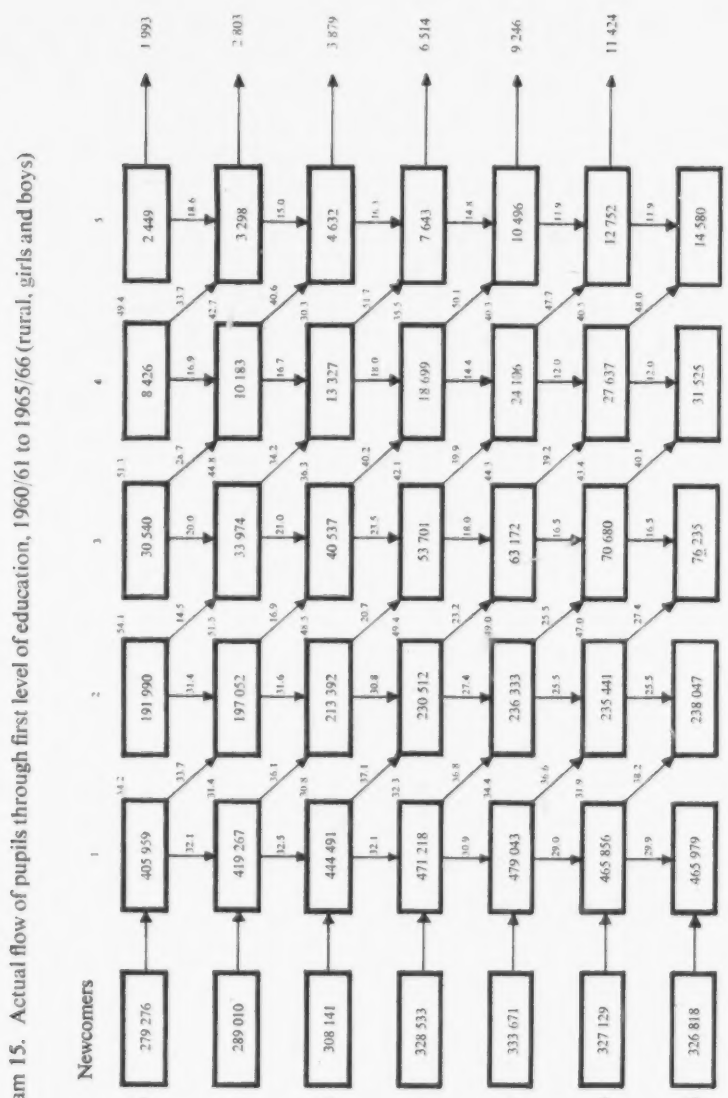
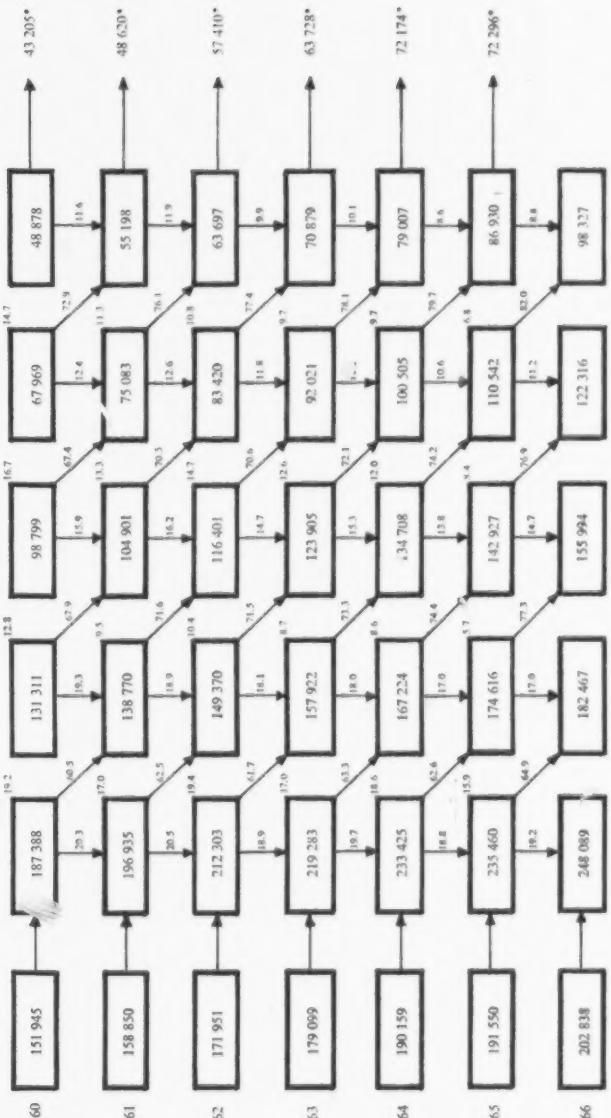


Diagram 15. Actual flow of pupils through first level of education, 1960/61 to 1965/66 (rural, girls and boys)

Diagram 16. Actual flow of pupils through first level of education, 1960/61 to 1965/66 (urban, girls only)



* Reported as successfully passing the final examination

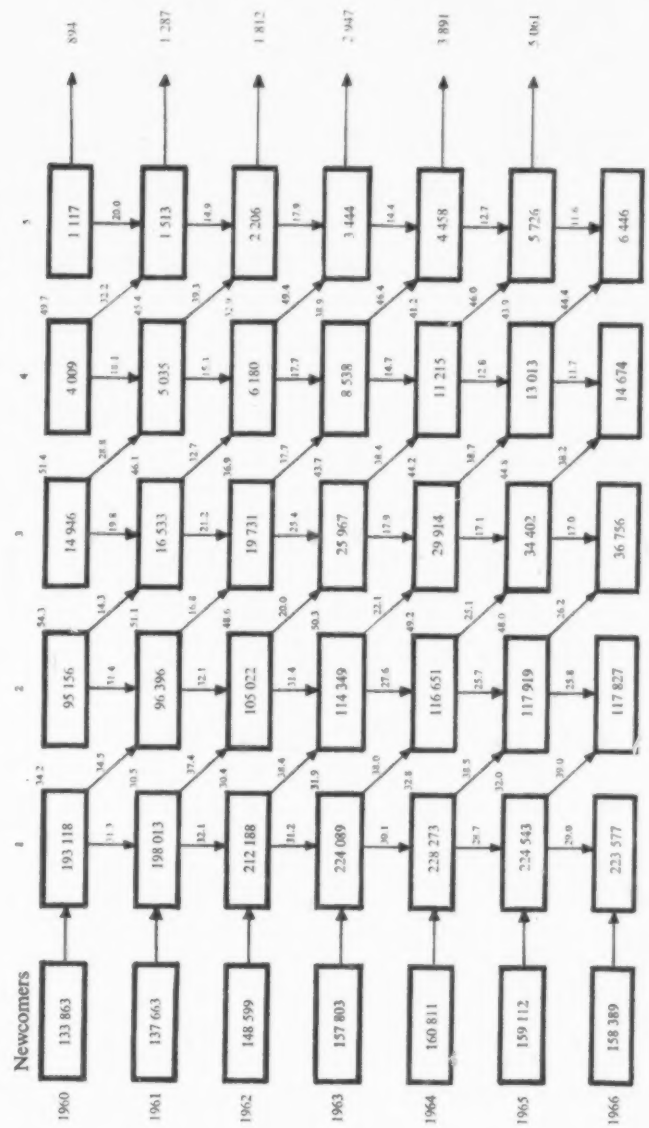
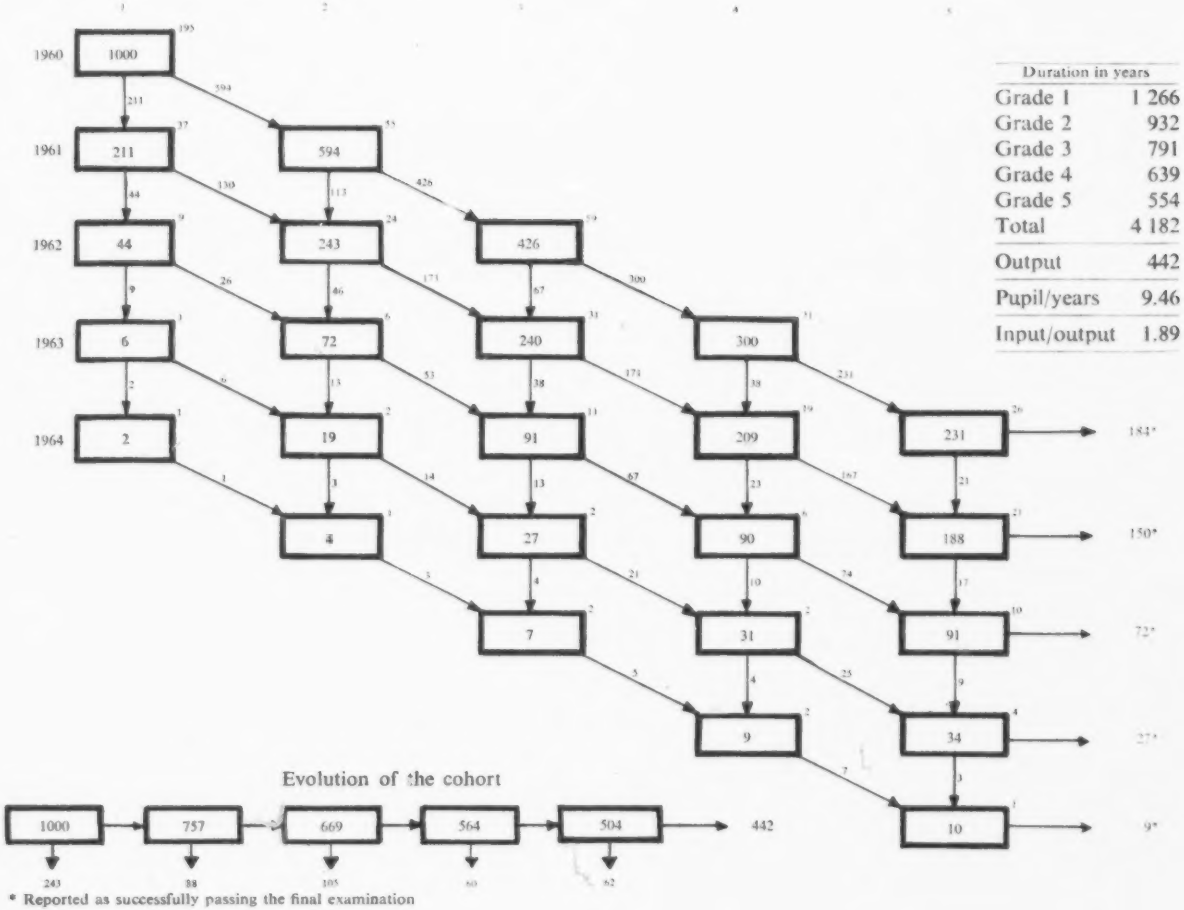


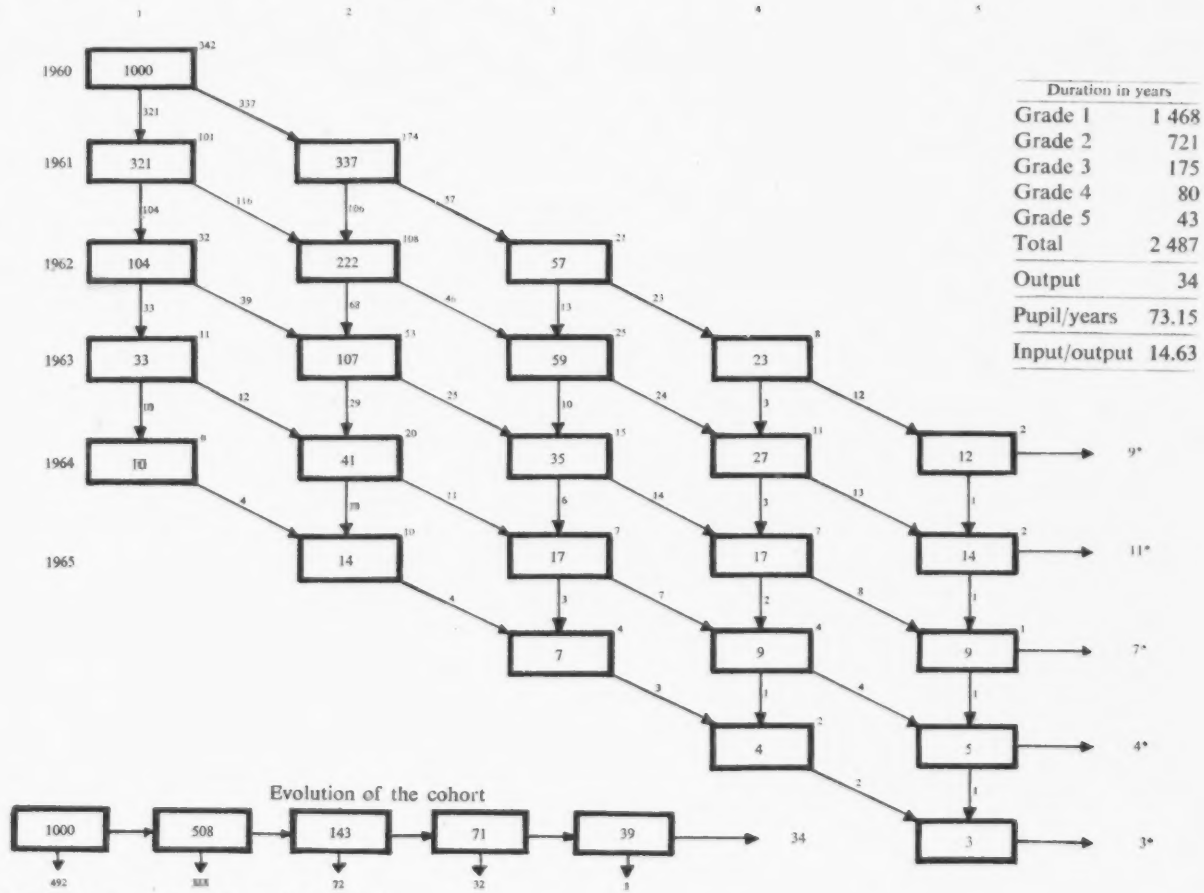
Diagram 17. Actual flow of pupils through first level of education, 1960/61 to 1965/66 (rural, girls only)

Diagram 18. First level of education (urban, girls and boys)



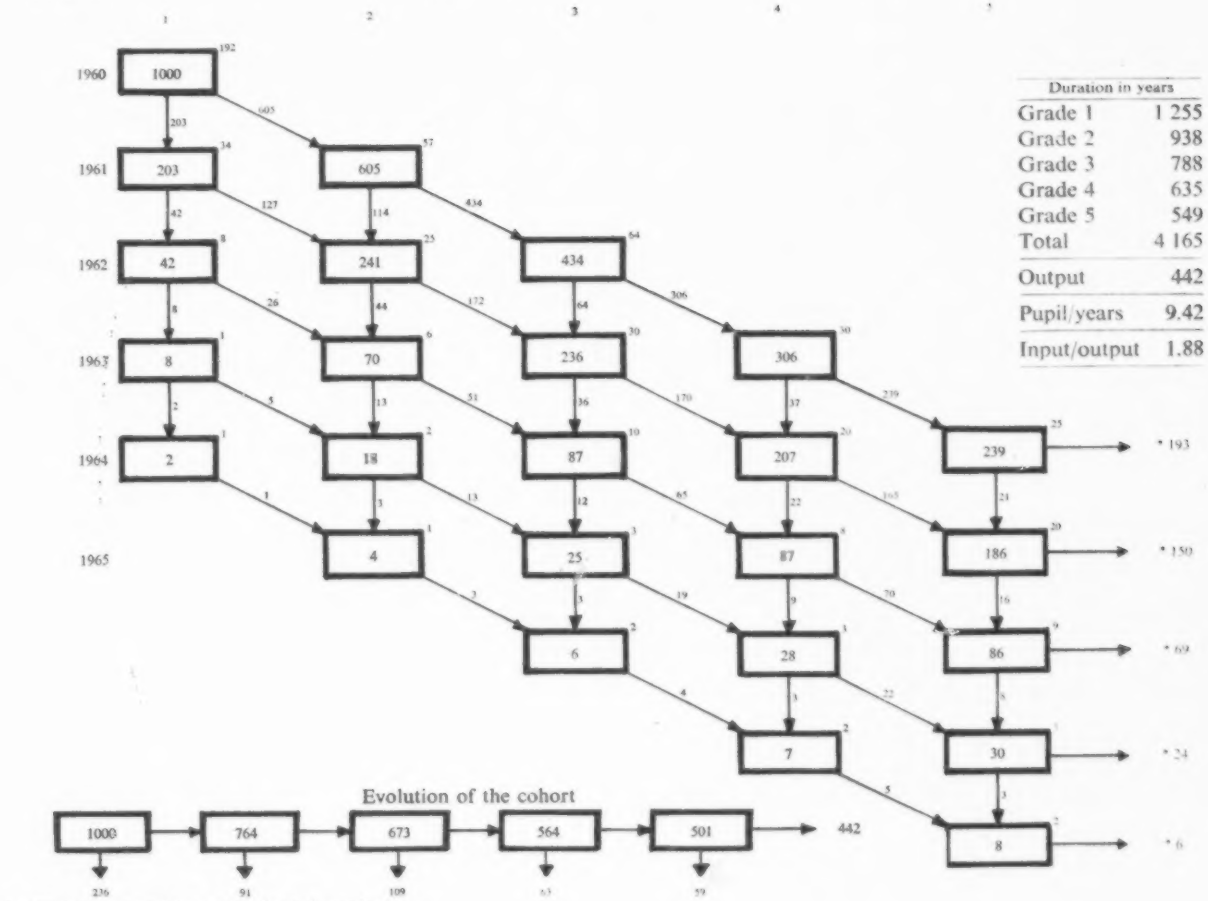
* Reported as successfully passing the final examination

Diagram 19. First level of education (rural, girls and boys)



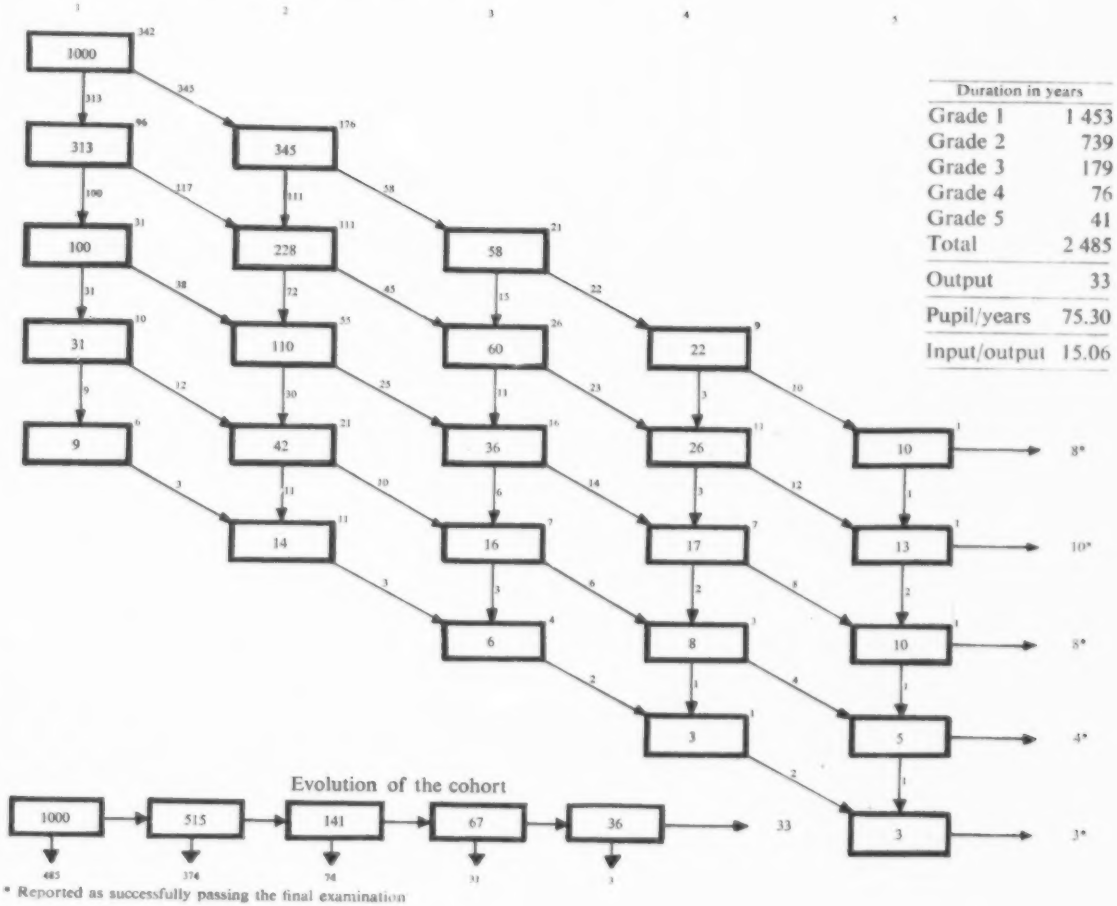
* Reported as successfully passing the final examination

Diagram 20. First level of education (urban, girls only)



* Reported as successfully passing the final examination

Diagram 21. First level of education (rural, girls only)



Duration in years	
Grade 1	1 453
Grade 2	739
Grade 3	179
Grade 4	76
Grade 5	41
Total	2 485
Output	33
Pupil/years	75.30
Input/output	15.06

* Reported as successfully passing the final examination

ANALYSIS OF URBAN AND RURAL WASTAGE

The main features of this analysis are extracted through the set of selected indicators of wastage:

		Urban zones		Rural zones	
		total	girls	total	girls
(i)	*Input/output ratio:*	1.89	1.88	14.63	15.06
(ii)	*Overall drop-out:*	55.8 %	55.8 %	96.6 %	96.7 %
	Output	44.2 %	44.2 %	3.4 %	3.3 %

It is interesting to note that 44.2 per cent of the pupils entering first level education in urban zones completed the cycle, while only 3.4 per cent (3.3 per cent of girls) completed the cycle in rural zones; also, in the first case, the over-investment amounted to 89 per cent, while in the second it was 13 to 14 times more than the optimum. This information can be related to the capacity of the education system in Colombia which provides a partial explanation of the high drop-out rate in rural zones.

Grades	Schools according to the number of grades offered in Colombia (1966)			
	urban zones	%	rural zones	%
1	316	4.15	775	4.60
2	588	7.72	9 897	58.76
3	711	9.34	3 604	21.39
4	953	12.52	1 580	9.38
5	5 046	66.27	988	5.87
Total	7 614	100.00	16 844	100.00

Source: Reply to a special questionnaire on school capacity.

The above data show that while 66.27 per cent of the schools in urban zones offer all grades, only 5.87 per cent of schools in rural zones do so. This factor should not be neglected when evaluating the findings on wastage.

(iii) *Drop-out by number of repeating years:*

Years repeated	Output							
	Urban zones				Rural zones			
	total	%	girls	%	total	%	girls	%
0	184	41.6	193	43.7	9	26.4	8	24.2
1	150	33.9	150	33.9	11	32.4	10	30.3
2	72	16.3	69	15.6	7	20.6	8	24.2
3	27	6.1	24	5.4	4	11.8	4	12.1
4	9	2.1	6	1.4	3	8.8	3	9.2
Total	442	100.0	442	100.0	34	100.0	33	100.0

Almost 60 per cent of the successful completers in urban zones repeat one or more years. This proportion is almost 75 per cent in rural zones.

(iv) *Promotion profiles* (Grade 1 = 1,000):

Grades	Urban zones		Rural zones	
	total	girls	total	girls
1	1 000	1 000	1 000	1 000
2	757	764	508	515
3	669	673	143	141
4	564	564	71	67
5	504	501	39	36
Total	442	442	34	33

(v) *Drop-out profiles:*

Grades	Urban zones		Rural zones	
	total	girls	total	girls
1	243	236	492	485
2	88	91	365	374
3	105	109	72	74
4	60	63	32	31
5	62	59	5	3
Total	558	558	966	967

In *urban zones*, more than 40 per cent of the over-all drop-out takes place in the first grade, as compared with 50 per cent in the case of rural zones. There is no difference in the sex pattern in this respect.

Another interesting inference is that while 56 per cent of the pupils in urban zones reach the fourth grade, the corresponding proportion in rural zones is only 7 per cent.

(vi) *Percentage of transition from grade to grade:*

Grades	Urban zones		Rural zones	
	total	girls	total	girls
1	75.7	76.4	50.8	51.5
2	88.4	88.1	28.1	27.4
3	84.3	83.8	49.7	47.5
4	89.4	88.8	54.9	53.7
5	87.7	88.2	87.2	91.7

The low transition in rural zones confirms all the conclusions stated previously.

(vii) *Percentage of pupil-years spent in excess:*

	Urban zones		Rural zones	
	total	girls	total	girls
Optimum to be invested (successful completers × 5)	2 210	2 210	170	165
Actual investment	4 182	4 165	2 487	2 485
Excess	1 972	1 955	2 317	2 320
Percentage of the total invested	47.2	46.9	93.2	93.4

This supplementary information is of great interest, particularly when considered in conjunction with the following two indicators, as the three of them together present a complete picture of the incidence of wastage on an educational system.

(viii) *Attribution of the pupil-years spent in excess:*

	Urban zones		Rural zones	
	total	girls	total	girls
Pupil-years spent in excess	1 972	1 955	2 317	2 320
Attributable to:				
(a) Graduates	411 (20.8%)	384 (19.6%)	49 (2.1%)	50 (2.2%)
(b) Drop-outs	1 561 (79.2%)	1 571 (80.4%)	2 268 (97.9%)	2 270 (97.8%)

(ix) ***Places absorbed by drop-outs but effective (i.e. leading to promotion) :***

	Total	Percentage of years attributed to drop-outs
Urban zones		
Total	726	46.5
Girls	734	46.7
Rural zones		
Total	625	27.6
Girls	627	27.6

The above set of indicators is of invaluable help since it allows a specific knowledge not only of the extent of wastage but, still more important, of the stages at which it occurs and of the relative significance of some of its factors.

Conclusion

The interest presented by the type of techniques described in the previous chapters goes beyond the simple assessment of the effectiveness of an education system during a given period. Their real value resides in their operational utilization for quantifying the implications of certain changes on the basis of selected alternatives. This is known as 'simulation technique', and educational planners and administrators use this approach to enable them to make the optimum decision in the light of the expected results. Thus, for any decision, it is crucial to know the different factors, their evolution, the consequences of their invariability or modification.

Moreover, it is evident that the only way to forecast educational change is to know the scope and rhythm of the school intake, the estimated sequence of educational attainment and the extent and pattern of graduation. The latter may call in question the existing facilities for education, its scope and content. The response made by education to the expected sequence is the acid test of the functioning of the education system.

It is currently admitted that the degree of technical knowledge in this field is still strictly limited. In this connection, the International Conference on Education [31] recommended several lines of inquiry calling for statistical studies, research and experiment. The purely statistical studies should be directed toward:

(*a*) Achievement of greater accuracy in the collection of data. This is of supreme importance, since a considerable margin of error in the data used will distort the meaning of the inferences to be drawn therefrom. This applies particularly to data on repeaters in those cases where the manner of collecting such data is not a sufficient guarantee of the precise status of either repeaters or newcomers. For instance, some schools might report as 'newcomers' certain pupils new to the school but who

were repeating the same grade they had already followed in some previous year.

(*b*) Checking the reliability of wastage indices and of the deductions to be drawn therefrom. Thus, it is essential to compare the conclusions reached by the analysis of wastage through the proposed methodology with the results of individualized surveys, so as to introduce the necessary coefficients of correction.

(*c*) Elaboration of techniques for the assessment of wastage in school systems without repetition or drop-out. This applies to the particular case of countries with automatic promotion (which are at present inadequately analysed through 'apparent cohort' methods) or with practically no repetition.

(*d*) Elaboration of indicators of wastage for the purpose of simulation on the basis of alternative hypotheses that have already been referred to above.

(*e*) The nature and incidence of wastage in higher education. This is an item which calls for very special studies due to the particular features of this educational level.

The projects being planned in this field will be successful only if those responsible for education at all levels are able to help by actively co-operating in the task of discovering the causes of wastage.

Appendixes

Appendix one

Selected list of studies and publications

1. Asian Institute of Educational Planning and Administration, New Delhi. *Wastage and stagnation in school education: a pilot study.* New Delhi, 1965, 44 p., tables (Publication no. 16).

2. Birkeland, E. *A model for predicting educational enrolments and output in the post-secondary educational system of Norway.* Oslo, Norwegian Research Council for Science and the Humanities, Research Department, 1967, 27 p.

3. Blot, D. Les déperditions d'effectifs scolaires: analyse théorique et applications. *Tiers-Monde (Paris)*, tome VI, no. 22, avril/juin 1965, p. 479-510.

4. Blot, D. Les redoublements dans l'enseignement primaire en France de 1960 à 1966. *Population (Paris)*, no. 4, juillet/août 1969, p. 685-709.

5. Brown, R. I.; Brimer, M. A. *A survey of wastage problems in elementary education.* Bangkok, Unesco Regional Office for Education in Asia, 1966. 158 p., figs. (processed).

6. Chesswas, J. D. *Methodologies of educational planning for developing countries.* Paris, Unesco: International Institute for Educational Planning, 1968. Vol. 1: Text, p. 18-19.

7. Conference of European Statisticians, Geneva, 1965. Working Group on Statistics of Education. *A school cohort coding system,* memorandum by L. Goldstone. Paris, Unesco, 1965. 11 p. (Unesco/SS/6/72/WP 2).

8. Conference of European Statisticians, Geneva, 1969. Working Group on Statistics of Education. *A modern system of educational statistics: the matrix-method,* by J. de Bruyn. Paris, Unesco, 1969.

9. Deblé, Isabelle. Les rendements scolaires dans les pays d'Afrique d'expression française. In: Paris. Université. Institut d'étude du développement économique et social. *Problèmes de planification de l'éducation.* Paris, Presses universitaires de France, 1964, p. 53-103 (Etudes Tiers monde).

10. Gouveia, Aparecida Joly; Havighurst, R. F. *Ensino médio e desenvolvimento*. São Paulo, Ed. Melhoramentos e Ed. Universidade de São Paulo, 1969, 23 p. (Biblioteca de educaçao).

11. Hennion, R. Indicateurs de plasticité et de croissance possible du système scolaire. *Plan/ed* (Dakar, Centre régional de planification de l'éducation), juin 1969, p. 12.

12. International Union for the Scientific Study of Population. *Multilinguol demographic dictionary*. English section. New York, United Nations, Department of Economic and Social Affairs, 1958, p. 6 (United Nations. Population Branch. Population studies, no. 29).

13. Maciel, Carlos Frederico. *Una metodologia para a operação-escola: planejamento da obrigatoriedade escolar primária no Recife*. Recife, Centro regional de pesquisas educacionais do Recife, 1969, 83 p. (processed).

14. Madagascar. Ministère des affaires culturelles. Direction générale des services académiques. *Rapport pour la Conférence internationale de l'éducation, Genève, 1970: tendances dans le domaine de l'éducation et amélioration de l'efficacité des systèmes d'enseignement*. Tananarive, 1970, 15 p., figs. (processed).

15. Maes, P. Méthodes statistiques de mesure du retard et du rendement scolaires. *Population (Paris)*, no. 2, avril/juin 1963, p. 359-62.

16. Malaysia. Ministry of Education. Educational Planning and Research Division. *Report of the follow-up on educational wastage and school dropouts in primary schools in West Malaysia*. Kuala Lumpur, 1967.

17. Netherlands. Central Bureau of Statistics. *Analysis of student performance*. The Hague, 1965, 40 p. (Statistical investigations on education and leisure, 1).

18. New York (City) Board of Education. Bureau of Educational Program Research and Statistics. *Pupils promotions in New York City: public intermediate and junior high schools, school year 1967/1968*. Prepared by M. S. Langlois. New York, 1969.

19. Organisation for Economic Co-operation and Development. *Education, human resources and development in Argentina*. Paris, 1967, 465 p., tables.

20. Paris. Université. Institut d'étude du développement économique et social. Groupe de recherche ' Economie de l'éducation '. *Les rendements de l'enseignement du premier degré en Afrique francophone*. Etude réalisée par Isabelle Deblé. Paris, 1967. Vol. 5.

21. Pottier. *Déroulement des scolarités dans l'enseignement élémentaire*. Paris, Ministère de l'éducation nationale, 1968 (Etudes et documents, no. 9).

22. Schreiber, D. *Holding power/large city school systems. A study of the holding power rates of school systems in 128 large cities, population over 90,000, based on the graduating classes of 1960-1963, inclusive*. Washington, National Education Association Project: School Dropouts, 1964, 78 p., tables.

23. Schreiber, D.; Kaplan, B. A.; Strom, R. D. *Dropout studies: design and conduct.* Washington, National Education Association Project: School Dropouts, 1965. 84 p., tables, bibl.

24. Tunisia. Secrétariat au Plan et à l'économie tunisienne. *Statistiques de l'enseignement, année scolaire 1965-66.* Tunis.

25. Unesco. Educational Planning Mission. *Educación y economía en Venezuela: situación actual y proyectos de educación para impulsar el desarrollo económico.* Informe de la Misión de planeamiento de la Unesco, Julio-Agosto de 1962. J. Chipman, jefe de la Misión. Paris, 1963, 264 p. (Unesco/VEN/PLM).

26. Unesco. Regional Centre for Educational Planning. *Stage de formation à l'emploi des méthodes statistiques, Bamako. 3-15 juillet 1967.* Dakar, 1967.

27. Unesco. Regional Office for Education in Asia. Technical Seminar on Educational Wastage and School Dropouts, Bangkok, September 1966. *Final report.* Bangkok, 1967. 40 p., figs.

28. Unesco. Regional Office for Education in Asia. The problem of educational wastage. In: *Bulletin of the Unesco Regional Office for Education in Asia (Bangkok)*, vol. 1, no. 2, March 1967.

29. Unesco : IBE. Working paper prepared for meeting of experts on educational wastage in preparation for the 32nd Session of the International Conference on Public Education, Geneva, 1969. *Patterns of educational wastage and their évolution.* Paris, Unesco, 1969. Mineographed.

30. Unesco : IBE International Conference on Education, 32nd, Geneva, 1970. *The statistical measurement of educational wastage: dropout, repetition and school retardation.* Paris, Unesco, 1970. (ED/BIE/CONFINTED 32/Ref. 1). Mineographed.

31. Unesco : IBE International Conference on Education, 32nd, Geneva, 1970. *Final Report.* Paris, Unesco, 1970.

32. U.S. Office of Education. Division of Operations Analysis. *Student-teacher population growth model: DYNAMOD II,* by E. K. Zabrowski, et al. Washington, 1967 (Technical note no. 34).

33. Van Vliet, W. Les années scolaires perdues. *Population (Paris)*, no. 3, juillet/septembre 1963, p. 532-44.

34. Van Waeyenbergue, R. L'école et l'enfant dans les pays du Tiers Monde. *Les Carnets de l'enfance* (Paris, UNICEF), no. 7, janvier 1968, p. 38-54.

35. Werdelin, I. *Statistics for educational planning and administration: methods and problems. Vol. 5: Planning a school system.* Malmö, Lärarhögskolan, 1967 (Educational and psychological interactions, no. 26).

36. Zakrzewski, G. *Movimiento de la matrícula primaria y factores que la afectan.* Santo Domingo, Secretaría de Estado de educación, bellas artes y cultos, 1969.

Appendix two

Three case-studies

A. DAHOMEY

DATA

The enrolment and repeaters by grade, from 1961 to 1968 inclusive, for the six grades of the first level of education in Dahomey are given below—Table 18 for boys and girls and Table 19 for girls only (in this table the repeaters by grade are not available for 1961).

Table 18

Dahomey. Enrolment at the first level of education, 1961-68 (girls and boys)

Year and category	Total all grades	Grade					
		1	2	3	4	5	6
1961							
Enrolment	97 073	27 624	18 995	16 184	13 564	10 847	9 859
of which repeaters	29 544	3 668	4 236	5 175	5 019	5 207	6 239
1962							
Enrolment	104 320	26 623	21 673	16 881	14 724	12 758	11 661
of which repeaters	14 496	3 840	2 360	2 058	1 760	1 868	2 610
1963							
Enrolment	114 006	29 721	21 129	20 135	15 022	14 161	13 838
of which repeaters	20 501	4 654	3 453	2 943	2 375	2 752	4 324
1964							
Enrolment	125 231	34 389	23 085	19 389	17 603	14 852	15 913
of which repeaters	22 773	4 234	3 670	3 253	2 770	3 399	5 447
1965							
Enrolment	130 774	35 407	25 495	20 776	16 486	16 418	16 192
of which repeaters	28 680	4 528	4 061	4 715	3 894	4 650	6 832
1966							
Enrolment	132 690	34 668	24 739	22 759	18 082	15 758	16 684
of which repeaters	27 756	4 800	4 014	4 048	3 590	4 181	7 123
1967							
Enrolment	139 734	37 010	26 447	22 533	19 817	17 080	16 847
of which repeaters	26 038	4 386	3 676	4 074	3 445	3 838	6 619
1968							
Enrolment	148 625	37 765	28 124	24 358	20 439	19 399	18 540
of which repeaters	28 276	4 979	3 976	4 367	3 650	4 339	6 965

Table 19
Dahomey. Enrolment at the first level of education, 1961-68 (girls only)

Year and category	Total all grades	Grade					
		1	2	3	4	5	6
1961							
Enrolment	26 562	7 991	5 533	4 309	3 615	2 838	2 276
of which repeaters	...	...	...	...	...	...	...
1962							
Enrolment	30 330	8 468	6 161	4 899	3 982	3 651	3 169
of which repeaters	4 472	1 265	793	633	535	558	688
1963							
Enrolment	34 242	9 444	6 790	5 775	4 460	3 839	3 724
of which repeaters	6 262	1 410	1 103	1 000	773	858	1 118
1964							
Enrolment	38 364	10 855	7 406	6 298	5 069	4 490	4 246
of which repeaters	7 442	1 404	1 386	1 169	926	1 105	1 452
1965							
Enrolment	40 645	11 685	7 844	6 596	5 161	4 749	4 610
of which repeaters	10 125	1 510	1 569	1 725	1 406	1 783	2 132
1966							
Enrolment	40 599	10 839	7 617	7 102	5 653	4 899	4 489
of which repeaters	8 430	1 516	1 259	1 320	1 186	1 333	1 816
1967							
Enrolment	43 144	11 792	8 186	7 003	6 163	5 294	4 706
of which repeaters	8 425	1 423	1 222	1 422	1 220	1 301	1 837
1968							
Enrolment	45 839	12 037	8 798	7 515	6 347	5 864	5 278
of which repeaters	8 938	1 521	1 327	1 461	1 247	1 393	1 989

It will be seen that although the enrolment of girls grew faster than total enrolment (i.e., 72 per cent compared with 53 per cent); girls represented only 31 per cent of the total enrolment in 1968 as against 27 per cent in 1961.

The proportion of repeaters was higher in the case of girls than for total enrolment and tended to increase. Thus, the proportion of repeaters, which was 13.9 per cent in 1962 (14.7 per cent for girls), increased to 19.0 per cent in 1968 (19.5 per cent for girls). The year in which the highest proportion of repetition took place, was 1965—as much as 21.9 per cent of the over-all enrolment was composed of repeaters; of these, 24.9 per cent were girls. Thus, one pupil out of five was enrolled again in the same grade as the previous year and one girl out of four.

RATES

Tables 20 and 21 show the movement of pupils and the relevant rates during the period.

Table 20
Dahomey. Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates, 1961-67 (girls and boys)

Year and category	Grade						Adjusted rates					
	1	2	3	4	5	6	1	2	3	4	5	6
1961												
Enrolment	27 624	18 995	16 184	13 564	10 847	9 859						
Repeaters	3 840	2 360	2 058	1 760	1 868	2 610	139	124	127	130	172	265
Promoted	19 313	14 823	12 964	10 890	9 051	7 249	699	780	801	803	834	735
Drop-outs	4 471	1 812	1 162	914	−72		162	96	72	67	−6	
1962												
Enrolment	26 623	21 673	16 881	14 724	12 758	11 661						
Repeaters	4 654	3 453	2 943	2 375	2 752	4 324	175	159	174	161	216	371
Promoted	17 676	17 192	12 647	11 409	9 514	7 337	664	793	749	775	746	629
Drop-outs	4 293	1 028	1 291	940	492		161	48	77	64	38	
1963												
Enrolment	29 721	21 129	20 135	15 022	14 161	13 838						
Repeaters	4 234	3 670	3 253	2 770	3 399	5 447	142	174	162	184	240	394
Promoted	19 415	16 136	14 833	11 453	10 466	8 391	653	764	737	762	739	606
Drop-outs	6 072	1 323	2 049	799	296		205	62	101	54	21	
1964												
Enrolment	34 389	23 085	19 389	17 603	14 852	15 913						
Repeaters	4 528	4 061	4 715	3 894	4 650	6 832	132	176	243	221	313	429
Promoted	21 434	16 061	12 592	11 768	9 360	9 081	623	696	649	669	630	571
Drop-outs	8 427	2 963	2 082	1 941	842		245	128	108	110	57	
1965												
Enrolment	35 407	25 495	20 776	16 486	16 418	16 192						
Repeaters	4 800	4 014	4 048	3 590	4 181	7 123	136	157	195	218	255	440
Promoted	20 725	18 711	14 492	11 577	9 561	*4 958	585	734	698	702	582	*306
Drop-outs	9 882	2 770	2 236	1 319	2 676	4 111	279	109	107	80	163	254
1966												
Enrolment	34 668	24 739	22 759	18 082	15 758	16 684						
Repeaters	4 386	3 676	4 074	3 445	3 838	6 619	127	149	179	191	244	397
Promoted	22 771	18 459	16 372	13 242	10 228	10 065	657	746	719	732	649	603
Drop-outs	7 511	2 604	2 313	1 395	1 692		216	105	102	77	107	
1967												
Enrolment	37 010	26 447	22 533	19 817	17 080	16 847						
Repeaters	4 979	3 976	4 367	3 650	4 339	6 965	135	150	194	184	254	413
Promoted	24 148	19 991	16 789	15 060	11 575	9 882	652	756	745	760	678	587
Drop-outs	7 883	2 480	1 377	1 107	1 166		213	94	61	56	68	

* Reported as successfully passing the final examination.

Table 21
Dahomey. Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates, 1961-67 (girls only)

Year and category	Grade						Adjusted rates					
	1	2	3	4	5	6	1	2	3	4	5	6
1961												
Enrolment	7 991	5 533	4 309	3 615	2 838	2 276						
Repeaters	1 265	793	633	535	558	688	158	143	147	148	197	302
Promoted	5 368	4 266	3 447	3 093	2 481	1 588	572	771	800	856	874	698
Drop-outs	1 358	474	229	– 13	– 201		170	86	53	–4	– 71	
1962												
Enrolment	8 468	6 161	4 899	3 982	3 651	3 169						
Repeaters	1 410	1 103	1 000	773	858	1 118	167	179	204	194	235	353
Promoted	5 687	4 775	3 687	2 981	2 606	2 051	672	775	753	749	714	647
Drop-outs	1 371	283	212	228	187		161	46	43	57	51	
1963												
Enrolment	9 654	6 790	5 775	4 460	3 839	3 724						
Repeaters	1 404	1 386	1 169	926	1 105	1 452	145	204	202	208	288	390
Promoted	6 020	5 129	4 143	3 385	2 794	2 272	624	755	717	759	728	610
Drop-outs	2 230	275	463	149	– 60		231	41	81	33	– 16	
1964												
Enrolment	10 855	7 406	6 298	5 069	4 490	4 246						
Repeaters	1 510	1 569	1 725	1 406	1 783	2 132	139	212	274	277	397	502
Promoted	6 275	4 871	3 755	2 966	2 478	2 114	578	658	596	585	552	498
Drop-outs	3 070	966	818	697	229		283	130	130	138	51	
1965												
Enrolment	11 685	7 844	6 596	5 161	4 749	4 610						
Repeaters	1 516	1 259	1 320	1 186	1 333	1 816	130	131	200	230	281	394
Promoted	6 358	5 782	4 467	3 566	2 673	*1 210	544	737	677	691	563	* 262
Drop-outs	3 811	803	809	409	743	1 584	326	102	123	79	156	344
1966												
Enrolment	10 839	7 617	7 102	5 653	4 899	4 489						
Repeaters	1 423	1 222	1 422	1 220	1 301	1 837	131	160	200	216	266	409
Promoted	6 964	5 581	4 943	3 993	2 869	2 652	642	733	696	706	586	591
Drop-outs	2 452	814	737	440	729		227	107	104	78	148	
1967												
Enrolment	11 792	8 186	7 003	6 163	5 294	4 706						
Repeaters	1 521	1 327	1 461	1 247	1 393	1 989	129	162	209	202	263	423
Promoted	7 471	6 054	5 100	4 471	3 289	2 717	634	740	728	726	621	577
Drop-outs	2 800	805	442	445	612		237	98	63	72	116	

* Reported as successfully passing the final examination.

A special feature of these two tables is the presentation of negative drop-out rates, which merit some comments. For example, for grade 5 in 1961 (Table 20) it can be seen that the number of pupils who in 1962 repeated, were promoted or dropped-out, exceeds by 72 (i.e. 0.6 per cent) the total enrolment in 1961. The same is true with regard to girls in grades 4 and 5 in 1961 and grade 5 in 1963 (Table 21), where there are also some slight excess figures of this order.

Several reasons can be found to explain this. Often migration to the country accounts for the massive extra intake in one or several grades of pupils from outside the flow. In other cases, the opening of new schools or an extension of the number of grades provided produce the return to school of pupils who left the education system for one or more years. This seems to be the case in Dahomey, although other causes might account for this phenomenon.

How to estimate these 'negative rates', and how to handle them in order to reconstruct the flow will be briefly described in practical terms.

Table 18 shows an enrolment in grade 5 for 1961 of 10,847 pupils. This grade in 1962 showed 1,868 repeaters coming, theoretically, from that same grade in 1961. The newcomers to grade 6 in 1962—or promoted from grade 5 in 1961—numbered 9,051 (i.e., enrolment in grade 6 in 1962 *minus* the corresponding repeaters, 11,661 – 2,610). The possible repeaters should now be looked for as a residual: Enrolled originally *minus* repeaters and promoted to following grade. This means:

Enrolment in grade 5 (1961)	=		10 847
Repeaters in grade 5 (1962)	=	1 868	
Promoted to grade 6 (1962)	=	9 051	10 919
			— 72

This gives an excess of 72 pupils among repeaters and promoted in 1962, instead of showing the usual residual. When converting the above categories into rates (see Table 20) we have—0.6 per cent as the drop-out rate.

Negligible as this rate appears to be—and negative rates are normally very low—it is evident that they conceal the actual flow of the school system under study and modify the pattern of reconstruction of the cohort.

These special cases provide in fact an interesting indicator, the nature of which calls for analysis. Why this negative rate is taking place and what is the reason for the marginal enrolment are two aspects of the same question. Once the reason is known (for instance, new classes made available in a given zone) the subtraction of the extra intake will replace the school group under study in its original context. If, for example, it is known that a series of schools provided courses in grade 6 as from 1962 and that some 200 pupils

returned to school in order to complete the level, it can be considered that the promotion as previously estimated (i.e. 9,051 pupils, minus 200 coming from outside the flow under study) gives a figure of 8,851 pupils only. In this case we have 128 pupils dropping out of the system, or a drop-out rate of 1.2 per cent.

In all cases, therefore, negative rates must be conveniently adjusted either by a survey of causes or, if that is not possible, by assuming a reasonable trend in drop-out and applying it. In the case of Dahomey this not necessary, since the rates for grades 4 and 5 are only applied for the reconstruction of the cohort from 1964 onwards.

Tables 20 and 21 also show the results of taking the number of pupils who successfully passed the final examination in grade 6. Again, it would be questionable to consider as normal drop-outs those pupils who neither passed the examination nor repeated that grade the following year. However, as a working hypothesis, these rates were adopted (25.4 per cent for total enrolment and 34.4 per cent for girls only).

FLOW OF PUPILS

Diagram 22 shows the actual flow of pupils from 1961 to 1968, and Diagram 23 gives the same picture for girls. The two main points arising from these diagrams are:

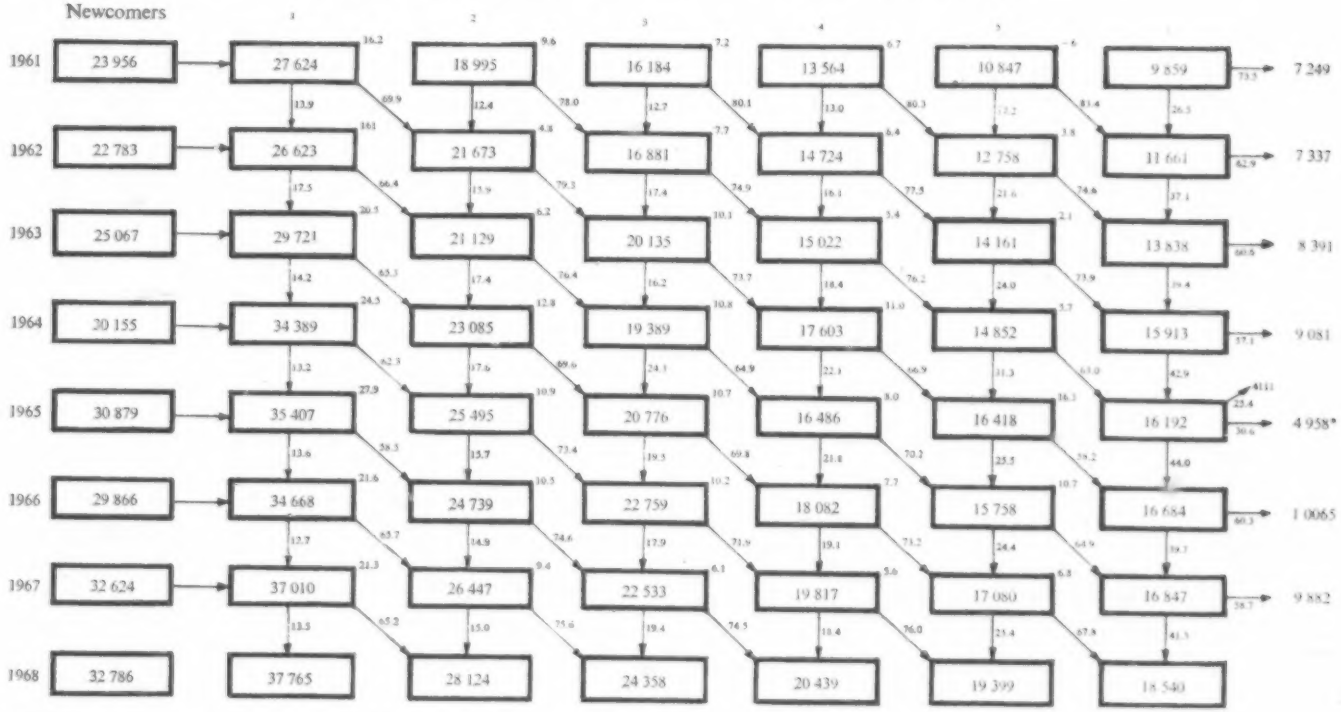
(*a*) On the one hand, there is a general decreasing trend in promotion rates in all grades and, on the other, both repetition and drop-out are increasing simultaneously in most grades.

(*b*) The girls' patterns of promotion are fairly similar to those for total enrolment—with the exception of first and last grades where they are much lower. Repetition is generally higher for girls. As regards drop-out, the rates are also generally higher with the exception of grades 2, 3 and 4, where they are somewhat lower.

RECONSTRUCTION OF THE COHORT

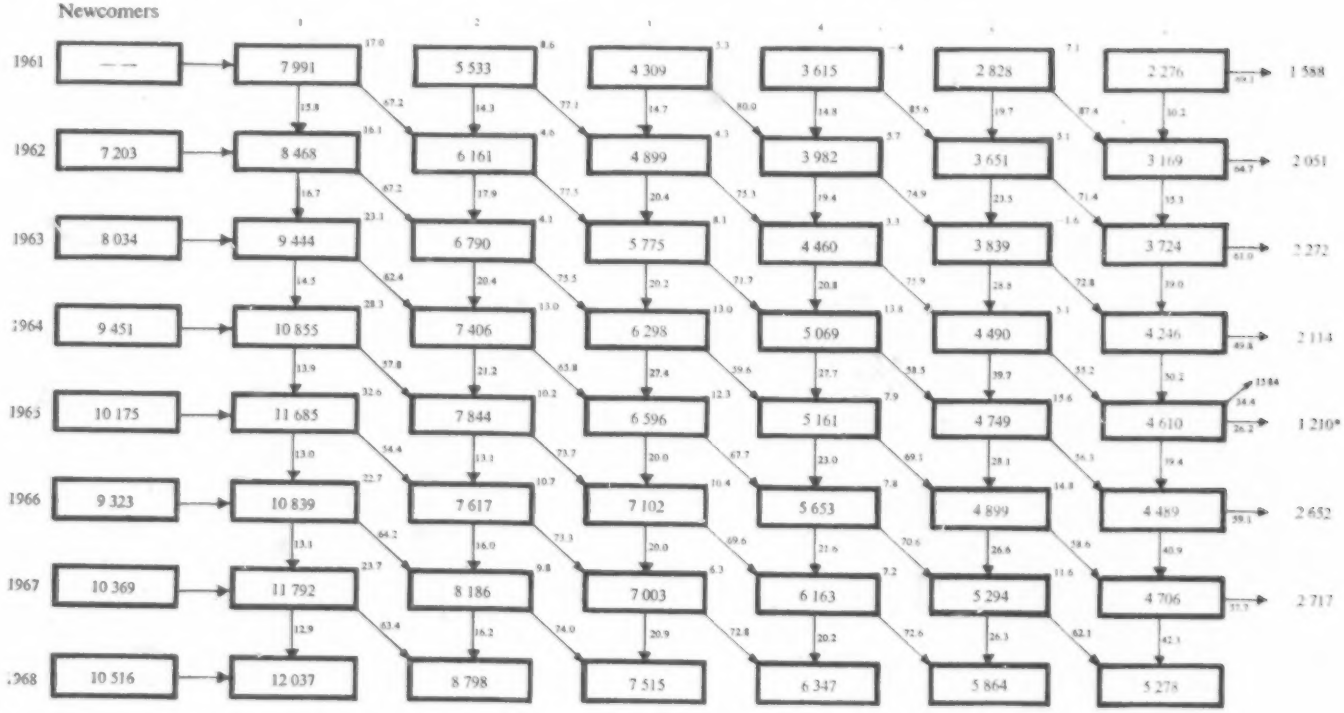
The successive application of each annual rate (as explained earlier) allows of the establishment of the corresponding flows (Diagram 24, total enrolment and Diagram 25, girls only).

Diagram 22. Dahomey. Actual flow of pupils through first level of education, 1961 to 1968 (girls and boys)



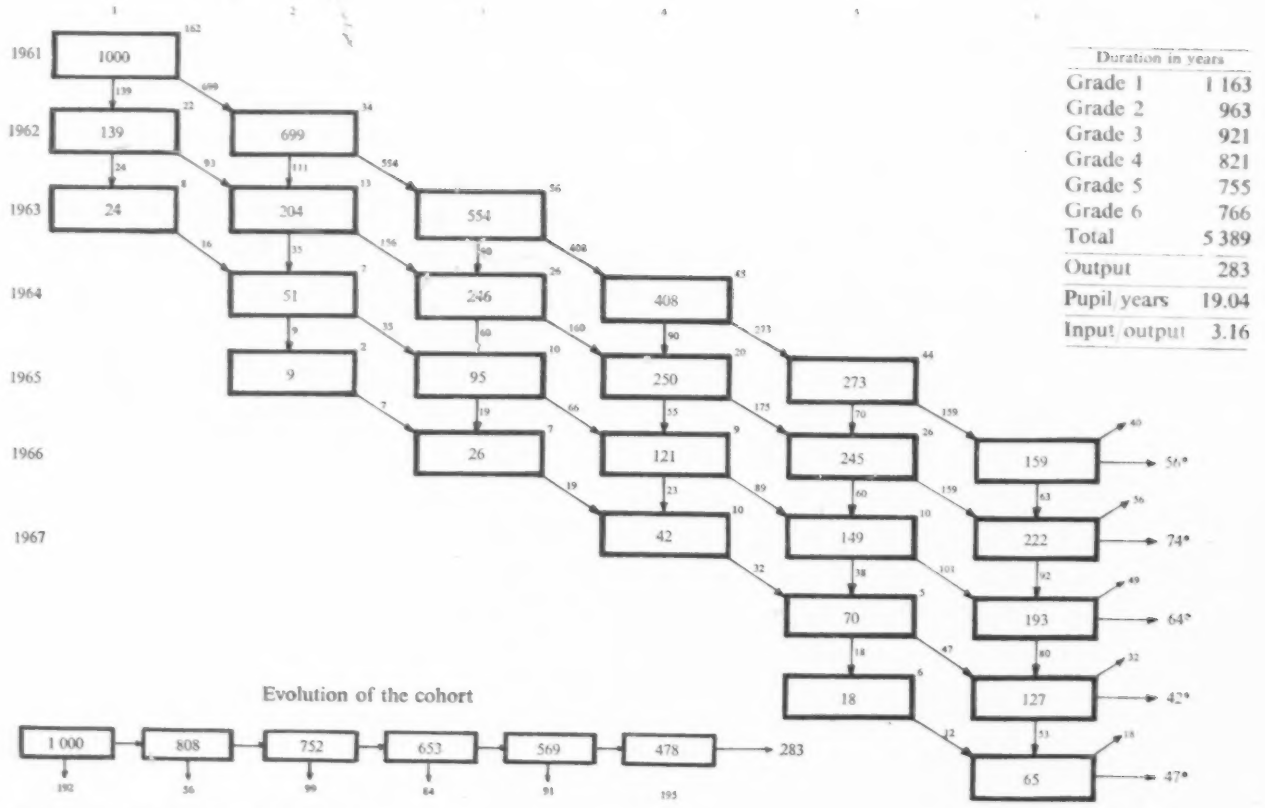
* Reported as successfully passing the final examination (Source: Dahomey. Ministère de l'éducation nationale, *Statistiques scolaires 1965/66*, p. 21).

Diagram 23. Dahomey. Actual flow of pupils through first level of education, 1961 to 1968 (girls only)



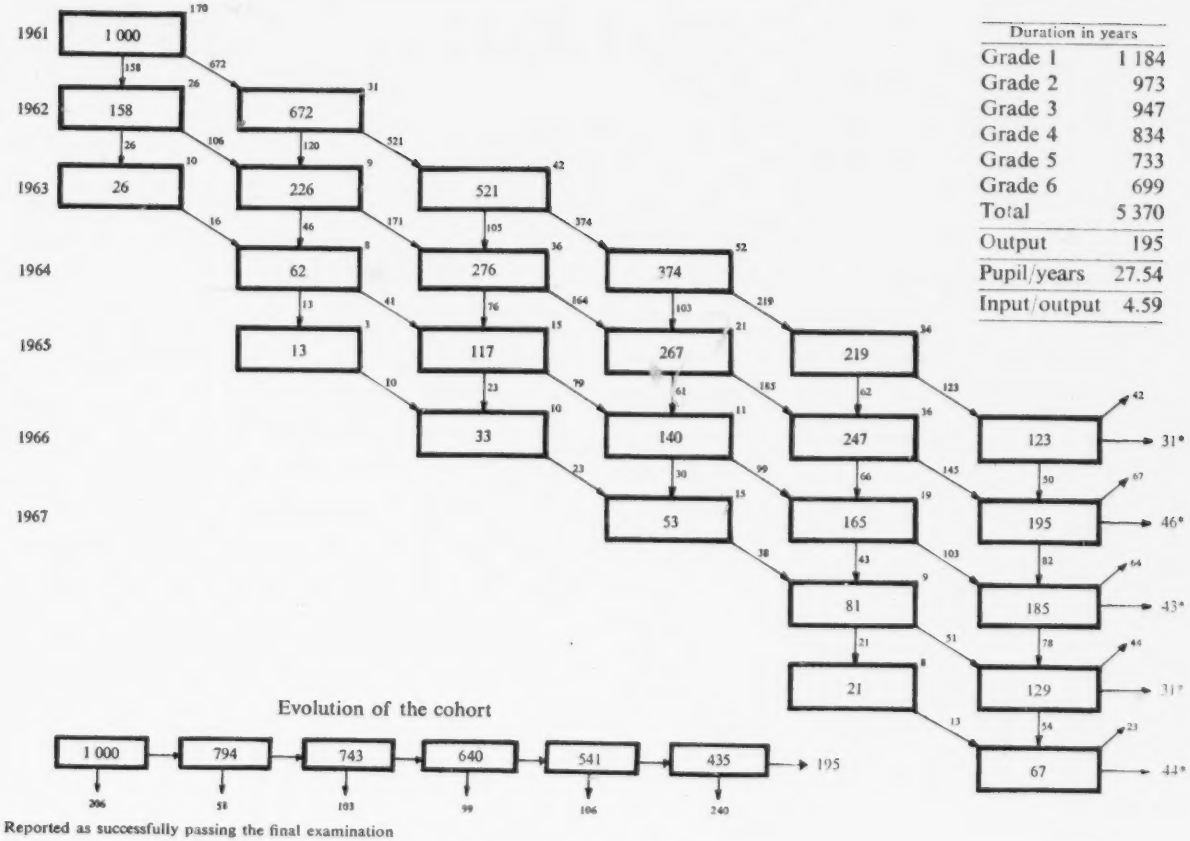
* Reported as successfully passing the final examination (Source: Dahomey. Ministère de l'éducation nationale, *Statistiques scolaires 1965/66*, p. 21).

Diagram 24. Dahomey. First level of education (girls and boys)



* Reported as successfully passing the final examination

Diagram 25. Dahomey. First level of education (girls only)



* Reported as successfully passing the final examination

ANALYSIS OF EFFICIENCY

The main features of internal efficiency at the first level of education in Dahomey can be summarized by means of the set of indicators already defined:

	Total	Girls only
(i) *Input/output ratio:*	3.16	4.59
(ii) *Over-all drop-out:*	71.6%	80.5%

Thus, less than 30 per cent of pupils entering first level education completed the cycle successfully—less than 20 per cent in the case of girls. The education system invested 216 per cent more than the minimum pupil-years required, and as much as 359 per cent more in the case of girls.

(iii) *Output by number of repeating years:*

Years repeated	Output			
	Total	%	Girls	%
0	56	19.7	31	15.9
1	74	26.1	46	23.6
2	64	22.5	43	22.1
3	42	14.8	31	15.9
4	47	16.9	44	22.5
Total	283	100	195	100

Only one-fifth of the pupils completing the cycle did so without repeating, one-sixth in the case of girls. Half of those completing repeated one or two years. The remainder (31.7 per cent of total and 38.4 per cent of girls) repeated 3 or 4 years.

(iv) *Promotion and drop-out profiles:*

Grades	Promotion (grade 1 = 1000)		Drop-out	
	total	girls	total	girls
1	1 000	1 000	192	206
2	808	794	56	51
3	752	743	99	103
4	653	640	84	99
5	569	541	91	106
6	478	435	195	240
Total	283	195	716	805

Drop-out is very heavy, especially in grades 1 and 6, although in the latter case certain reservations must be made.

(v) *Percentage of transition from grade to grade:*

Grades	Total %	Girls %
1	80.8	79.4
2	93.1	93.6
3	86.8	86.1
4	87.1	84.5
5	84.0	80.4
6	59.4	44.8

(vi) *Percentage of pupil/years spent in excess:*

		Total	Girls
Optimum pupil/years to be invested			
Total:	283×6	1 698	
Girls:	195×6		1 170
Total invested		5 389	5 370
Excess		3 691	4 200
Percentage of the total invested		68.5	78.2

(vii) *Attribution of the pupil/years spent in excess:*

		Total		Girls	
Pupil/years spent in excess		3 691		4 200	
Attribution to:	(*a*) graduates	514	(14.0)	401	(9.5)
	(*b*) drop-outs	3 175	(86.0)	3 799	(90.5)

(viii) *Places absorbed by drop-outs, but effective (i.e. leading to promotion):*

Total = 1 845 years or 58.1% of the years attributable to drop-outs
Girls = 2 178 years or 57.3% of the years attributable to drop-outs

CONCLUSION

With the indicators provided it is possible to work out a brief diagnosis of Dahomey's first level education system. The increasing pattern of repetition (very high in grades 4 and 5 and particularly so in grade 6) together with very high drop-out in grade 1 account for a poor output and a heavy 'cost'.

B. INDIA

DATA AND RATES

The enrolment by grade from 1963 to 1965 inclusive and repeaters by grade for 1964 and 1965 are shown in Tables 22 and 23. They cover the first level of education in India (for total enrolment and girls only) which is composed of five grades in a primary stage and three grades in a middle stage. Both stages will be analysed separately since they represent two different phases in Indian education.

The data only allow for the derivation of rates for two subsequent years, which is normally insufficient for the assumption of a given trend and therefore prevents the reconstruction of any flow. However, in this particular case, research undertaken by the Indian Ministry of Education proved that during the period 1960 to 1966 the movements were so similar that meaningful conclusions were obtainable by assuming their validity for that period.

From 1963 to 1965 the enrolment of girls increased more rapidly than the over-all enrolment (19 as against 13 per cent), but even in 1965 it only represented 36 per cent of total enrolment. The proportion of repeaters (20 per cent) was similar for girls and for total enrolment, i.e. one out of every five.

The movement of pupils and the corresponding rates, for the primary and middle stages are shown in Tables 24 and 25.

FLOW OF PUPILS

The actual flow of pupils from 1963 to 1965 and also that for girls, for both stages, are shown in Diagrams 26 and 27 (see pages 107 and 108).

Despite the short period it can be seen that: (*a*) promotion rates tend to decrease slightly in all grades at the primary stage, the pattern being more stable at the middle stage; (*b*) the trend in repetition is towards its reduction in all grades, smoothly at the primary stage, rather rapidly at the middle stage; (*c*) drop-out rates continue to increase at all grades and stages; (*d*) both repetition and drop-out rates are, in general, slightly higher for girls only compared with total enrolment.

RECONSTRUCTION OF THE COHORT

By applying the rates—assuming the stability of the latest rates supplied by the Indian statisticians—diagrams for the primary stage (total enrolment and girls only) and for the middle stage (total enrolment and girls only), can be established (see Diagrams 28-31 on pages 109-112).

Table 22

India. Enrolment at the first level of education (girls and boys)

Year and category	Total all grades	Primary stage (grades)					Middle stage (grades)		
		1	2	3	4	5	1	2	3
1963									
Enrolment	44 459 661	16 905 528	9 824 113	7 492 545	5 754 632	4 572 843	3 608 135	2 889 075	2 544 632
of which repeaters	...	...	...	...	...	...	...	...	...
1964									
Enrolment	48 218 307	18 240 602	10 373 531	8 214 680	6 425 247	4 964 247	3 934 377	3 207 213	2 652 769
of which repeaters	9 501 364	4 474 101	1 977 135	1 373 878	997 745	678 505	588 596	437 353	357 563
1965									
Enrolment	50 471 222	18 889 970	10 766 539	8 550 917	6 882 430	5 381 366	4 196 176	3 453 003	2 883 125
of which repeaters	10 068 356	4 741 895	2 105 893	1 450 112	1 027 472	742 984	524 683	407 855	354 421

Table 23

India. Enrolment at the first level of education (girls only)

Year and category	Total all grades	Primary stage (grades)					Middle stage (grades)		
		1	2	3	4	5	1	2	3
1963									
Enrolment	15 428 922	6 283 003	3 448 413	2 515 940	1 825 649	1 355 917	968 396	757 484	631 051
of which repeaters	...	...	...	...	...	...	...	...	...
1964									
Enrolment	17 166 109	6 948 612	3 752 420	2 836 778	2 103 893	1 524 406	1 084 669	856 575	673 663
of which repeaters	3 545 081	1 729 056	752 440	476 825	346 002	240 758	180 485	144 775	106 615
1965									
Enrolment	18 293 211	7 309 790	3 954 487	3 026 630	2 318 509	1 683 795	1 172 329	929 232	744 711
of which repeaters	3 826 251	1 880 495	797 394	528 854	369 471	250 037	157 945	121 068	83 911

Table 24

India. Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (girls and boys)

Year and category	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
Primary stage										
1963										
Enrolment	16 905 528	9 824 113	7 492 545	5 754 632	4 572 843					
Repeaters	4 474 101	1 977 135	1 373 878	997 745	678 505	265	201	183	173	148
Promoted	8 396 396	6 840 802	5 427 502	4 285 742	3 894 338	497	696	725	745	852
Drop-outs	4 035 031	1 006 176	691 165	471 145		238	103	92	82	
1964										
Enrolment	18 240 602	10 373 531	8 214 680	6 425 247	4 964 247					
Repeaters	4 741 895	2 105 893	1 450 112	1 027 472	742 984	259	203	177	160	150
Promoted	8 660 646	7 100 805	854 958	4 638 382	4 221 263	476	685	713	722	850
Drop-outs	4 838 061	4 166 833	5 909 610	759 393		265	112	111	118	
Middle stage										
1963										
Enrolment	3 608 135	2 889 075	2 544 632							
Repeaters	588 596	437 353	357 563			163	151	141		
Promoted	2 769 860	2 295 206	2 187 069			768	795	859		
Drop-outs	249 679	156 516				69	54			
1964										
Enrolment	3 934 377	3 207 213	2 652 769							
Repeaters	524 683	407 855	354 421			133	127	134		
Promoted	3 045 148	2 528 704	2 298 348			774	789	866		
Drop-outs	364 546	270 654				93	84			

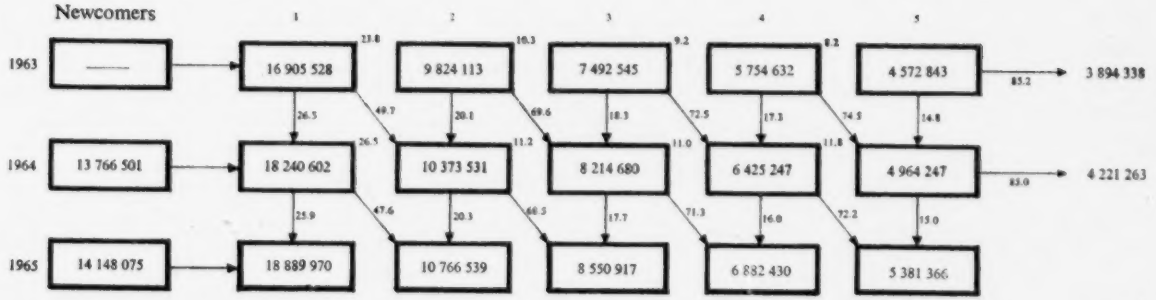
Table 25

India. Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (girls only)

Year and category	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
Primary stage										
1963										
Enrolment	6 283 003	3 448 413	2 515 940	1 825 649	1 355 917					
Repeaters	1 729 056	752 440	476 825	346 002	240 758	275	218	189	190	178
Promoted	2 999 980	2 359 953	1 757 891	1 283 643	1 115 159	477	684	699	703	822
Drop-outs	1 553 967	336 020	281 224	195 999		248	98	112	107	
1964										
Enrolment	6 948 612	3 752 420	2 836 778	2 103 893	1 524 406					
Repeaters	1 880 495	797 394	528 854	369 471	250 037	271	212	186	176	164
Promoted	3 157 093	2 497 776	1 949 038	1 433 758	1 274 369	454	666	687	681	836
Drop-outs	1 911 034	457 250	358 886	300 664		275	122	127	143	
Middle stage										
1963										
Enrolment	968 396	757 484	631 051							
Repeaters	180 485	144 775	106 615			187	191	169		
Promoted	711 800	567 048	524 436			735	749	831		
Drop-outs	76 111	45 661				78	60			
1964										
Enrolment	1 084 669	856 575	673 663							
Repeaters	157 945	121 068	83 911			146	141	125		
Promoted	808 164	660 800	589 752			745	772	875		
Drop-outs	118 560	74 707				109	87			

Diagram 26. Actual flow of pupils through first level of education, 1963 to 1965 (girls and boys)

Primary stage



Middle stage

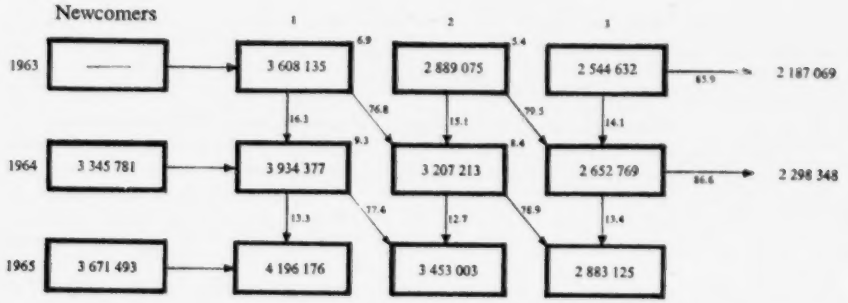
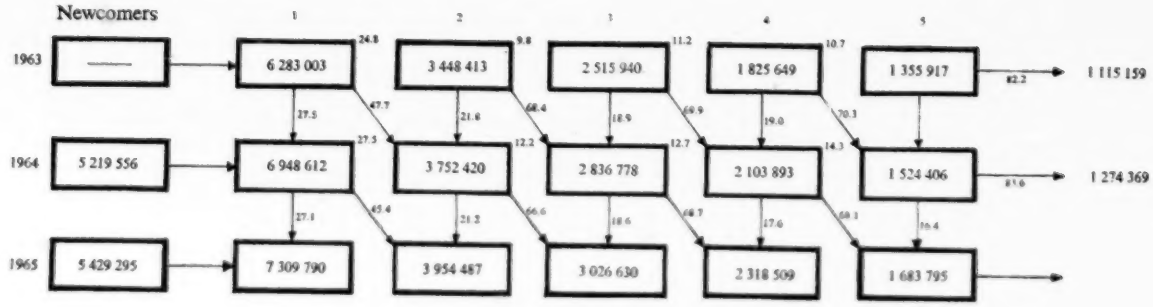


Diagram 27. Actual flow of pupils through first level of education, 1963 to 1965 (girls only)

Primary stage



Middle stage

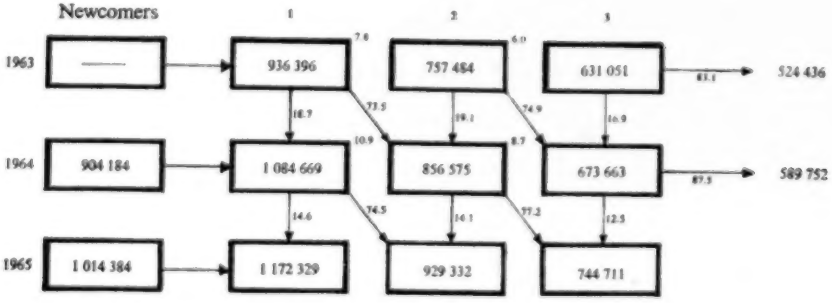
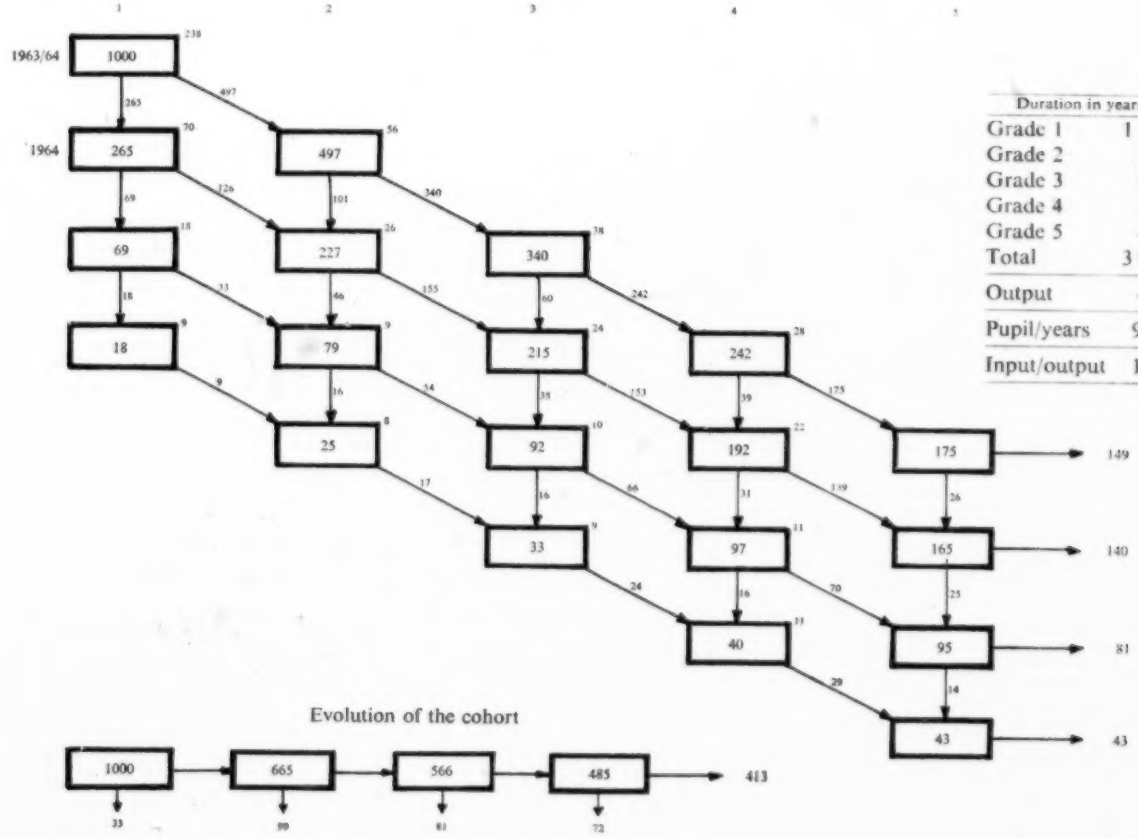
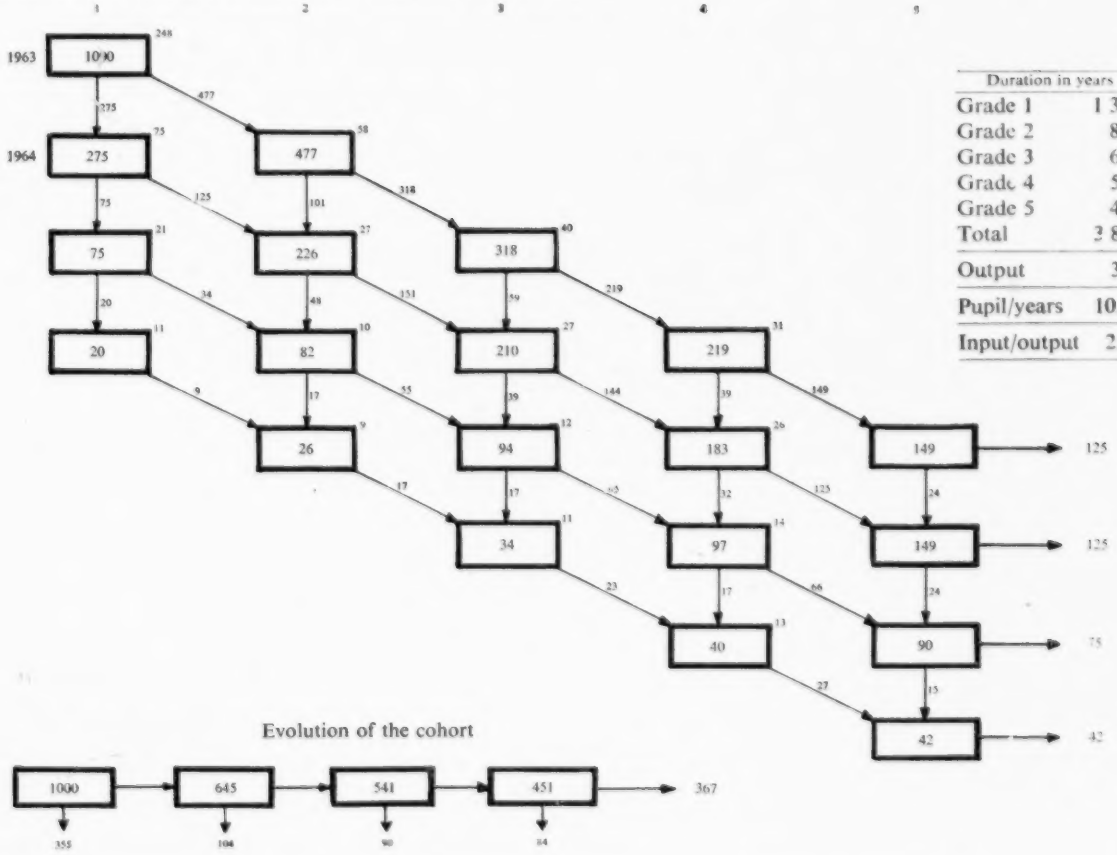


Diagram 28. First level of education, primary stage (girls and boys)



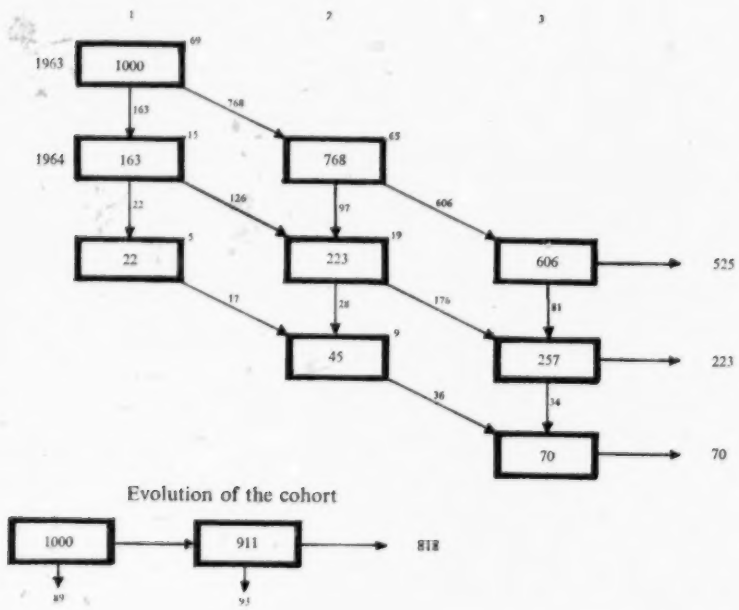
Duration in years	
Grade 1	1 352
Grade 2	828
Grade 3	680
Grade 4	571
Grade 5	478
Total	3 909
Output	413
Pupil/years	9.46
Input/output	1.89

Diagram 29. First level of education, primary stage (girls only)



Duration in years	
Grade 1	1 370
Grade 2	811
Grade 3	656
Grade 4	539
Grade 5	430
Total	3 806
Output	367
Pupil/years	10.37
Input/output	2.07

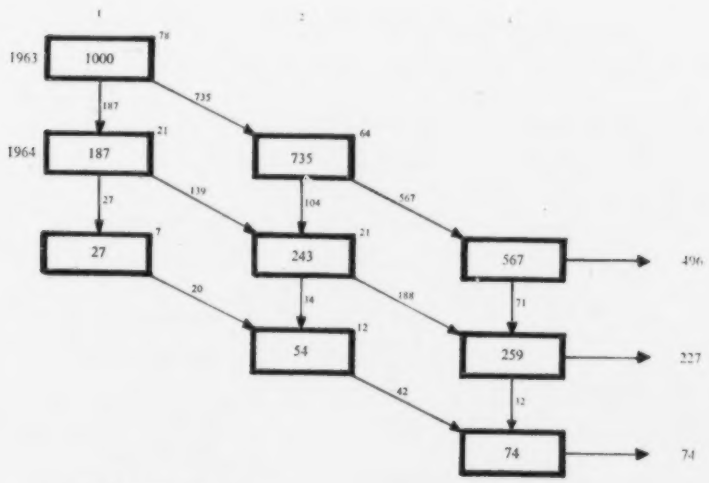
Diagram 30
First level of education, middle stage (girls and boys)



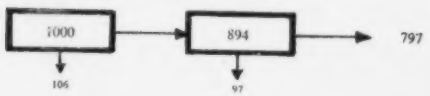
Evolution of the cohort

Duration in years	
Grade 1	1 185
Grade 2	1 036
Grade 3	933
Total	3 154
Output	818
Pupil/years	3.86
Input/output	1.29

Diagram 31
First level of education, middle stage (girls only)



Evolution of the cohort



Duration in years	
Grade 1	1 214
Grade 2	1 032
Grade 3	900
Total	3 146
Output	797
Pupil/years	3.95
Input/output	1.32

ANALYSIS OF EFFICIENCY

The selected indicators can be used to summarize the main features of Indian internal efficiency at the first level of education:

	Primary stage		Middle stage	
	total	girls	total	girls
(i) *Input/output ratio:*	1.89	2.07	1.29	1.32
(ii) *Over-all drop-out:*	58.7%	63.3%	18.2%	20.3%

Drop-out at the primary stage is noticeable but relatively low if compared with other countries in the region. Girls' drop-out patterns are somewhat worse. In total enrolment, 89 per cent of the resources are over-employed; in the case of girls, the proportion is slightly over 100 per cent. At the middle stage, drop-out is relatively low and the radio shows less than 30 per cent of over-investment for over-all enrolment, as compared with 32 per cent for girls.

(iii) *Output by number of repeating years:*

Years repeated	Output			
	total	%	girls	%
Primary stage				
0	149	36.1	125	34.1
1	140	33.9	125	34.1
2	81	19.6	75	20.4
3	43	10.4	42	11.4
Total	413	100.0	367	100.0
Middle stage				
0	525	64.2	496	62.2
1	223	27.3	227	28.5
2	70	8.5	74	9.3
Total	818	100.0	797	100.0

Slightly over one-third of the pupils completing the cycle did not repeat at the primary stage. At the middle stage, close upon two-thirds of successful completers did not repeat. In both stages, the girls' results approximated these totals.

(iv) *Promotion and drop-out profiles :*

Grades	Promotion (grades 1 = 1000)		Drop-out	
	total	girls	total	girls
Primary stage				
1	1 000	1 000	335	355
2	665	645	99	104
3	566	541	81	90
4	485	451	72	84
5	413	367	—	—
Total	—	—	587	633
Middle stage				
1	1 000	1 000	89	106
2	911	894	93	97
3	818	797	—	—
Total	—	—	182	203

More than half the total drop-out took place in grade 1 at the primary stage. At the middle stage, drop-out did not assume significance at any particular point. Again, girls' patterns were in this case rather similar to those of over-all enrolment, as can be seen in the transition profile below:

(v) *Percentage of transition from grade to grade :*

Grades	Total	Girls
Primary stage		
1	66.5	64.5
2	81.5	83.9
3	85.7	83.4
4	85.2	81.4
5	—	—
Middle stage		
1	91.1	89.4
2	90.0	89.1
3	—	—

(vi) *Percentage of pupil/years spent in excess :*

	Primary stage		Middle stage	
	total	girls	total	girls
Optimum pupil/years to be invested	2 065	1 835	2 454	2 391
Total invested	3 909	3 806	3 154	3 146
Excess	1 844	1 971	700	755
Percentage of total invested	47.2	51.8	22.2	24.0

(vii) *Attribution of pupil/years spent in excess:*

	Primary stage		Middle stage	
	total	girls	total	girls
Pupil/years spent in excess	1 844	1 971	700	755
Attributable to:				
(*a*) graduates	431 (23.4%)	401 (20.3%)	363 (51.9%)	375 (49.7%)
(*b*) drop-outs	1 413 (76.6%)	1 570 (79.7%)	337 (48.1%)	380 (50.3%)

(viii) *Places absorbed by drop-outs but effective (i.e. leading to promotion):*

Primary stage

Total: 477 or 33.8% of the years attributable to drop-outs
Girls: 536 or 34.1% of the years attributable to drop-outs

Middle stage

Total: 93 or 27.6% of the years attributable to drop-outs
Girls: 97 or 25.5% of the years attributable to drop-outs

CONCLUSION

The magnitude of drop-out in the first grade at the primary stage and repetition in the first three grades seem to be the major problems attaching to this stage. On the other hand, the middle stage seems to tend towards a comparatively modest level of repetition and drop-out.

C. MOROCCO

DATA AND RATES

Table 26 shows the enrolment and repeaters by grade from 1963 to 1969 inclusive in public modern first level education, representing 95 per cent of the over-all first level in 1969. The data refer to total enrolment since detailed information on girls' enrolment is not available.

It will be noticed that while enrolment increased by 8.7 per cent during the period, the number of repeaters increased by 54.2 per cent. The repeaters, who in 1963 represented 21 per cent of the total enrolment, represented as much as 29.9 per cent in 1969.

The movement of pupils and the corresponding rates are shown in Table 27.

Table 26

Morocco. Enrolment at the first level of education (girls and boys)

Year and category	Total all grades	Grade				
		1	2	3	4	5
1963						
Enrolment	995 062	264 638	195 376	185 754	164 925	184 369
of which repeaters	209 960	53 482	36 241	36 432	44 510	39 292
1964						
Enrolment	1 008 733	255 899	204 828	186 116	171 090	190 750
of which repeaters	266 281	61 032	35 982	41 645	43 719	80 303
1965						
Enrolment	1 030 791	272 848	196 598	191 099	172 398	197 848
of which repeaters	278 538	60 929	40 948	45 107	46 818	84 736
1966						
Enrolment	1 001 951	237 825	203 878	188 196	173 988	198 064
of which repeaters	295 028	67 152	41 470	47 431	48 637	90 338
1967						
Enrolment	1 031 588	260 612	193 707	196 482	175 525	205 262
of which repeaters	296 296	58 523	44 033	48 879	51 106	93 755
1968						
Enrolment	1 057 951	260 680	204 984	194 775	183 372	214 140
of which repeaters	318 368	66 502	42 691	51 938	53 485	103 752
1969						
Enrolment	1 081 258	261 494	211 470	202 741	185 306	220 247
of which repeaters	323 801	62 040	44 992	52 619	56 502	107 648

Table 27

Morocco. Enrolment, repeaters, promoted and drop-outs at the first level of education and adjusted rates (girls and boys)

Year and category	Grade					Adjusted rates				
	1	2	3	4	5	1	2	3	4	5
1963										
Enrolment	264 638	195 376	185 754	164 925	184 369					
Repeaters	61 032	39 582	41 645	43 719	80 303	231	203	224	265	436
Promoted	165 246	144 521	127 371	110 447	104 066	624	740	686	670	564
Drop-outs	38 360	11 273	16 738	10 759		145	57	90	65	
1964										
Enrolment	255 899	204 828	186 166	171 090	190 750					
Repeaters	60 929	40 948	45 107	46 818	84 73o	238	200	242	274	444
Promoted	155 650	145 992	125 580	113 112	*54 173	608	713	675	661	*284
Drop-outs	39 320	17 888	15 479	11 160	51 841	154	87	83	65	272
1965										
Enrolment	272 848	196 598	191 099	172 398	198 848					
Repeaters	67 152	41 470	47 371	48 637	90 338	246	211	248	282	457
Promoted	162 408	140 765	125 351	107 726	*58 365	595	716	656	625	*295
Drop-outs	43 288	14 363	18 317	16 035	49 145	159	73	96	93	248
1966										
Enrolment	237 825	203 878	188 196	173 988	198 064					
Repeaters	58 523	44 033	48 879	51 106	93 755	246	216	260	293	473
Promoted	149 674	147 603	124 419	111 507	*58 231	629	724	661	641	*294
Drop-outs	29 628	12 242	14 898	11 375	46 078	125	60	79	66	233
1967										
Enrolment	260 612	193 707	196 482	175 225	205 262					
Repeaters	66 502	42 691	51 938	53 485	103 752	255	220	264	305	505
Promoted	162 293	142 837	129 887	110 388	*50 905	623	738	661	630	*248
Drop-outs	31 817	8 179	14 657	11 352	50 605	122	42	75	65	247
1968										
Enrolment	260 680	204 984	194 775	183 372	214 140					
Repeaters	62 040	44 992	52 619	56 502	107 648	238	219	270	308	502
Promoted	166 478	150 122	128 804	112 599	*53 107	639	732	661	614	*248
Drop-outs	32 162	9 870	13 352	14 271	53 385	123	48	69	78	250

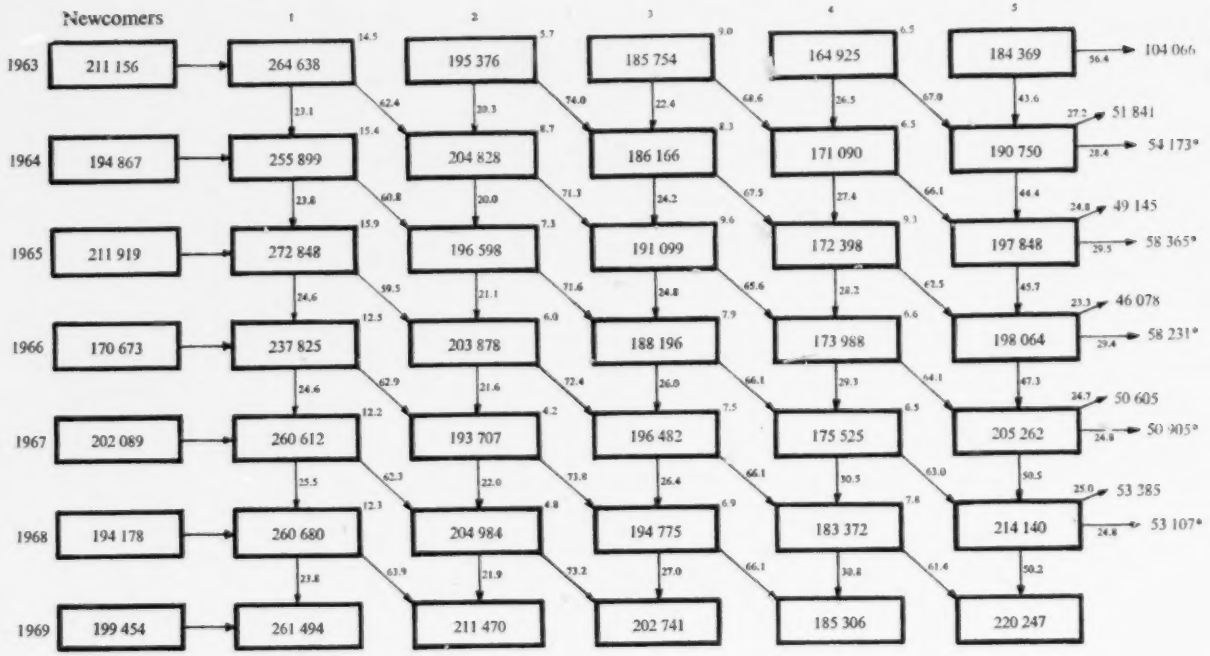
* Reported as successfully passing the final examination.

FLOW OF PUPILS AND RECONSTRUCTION OF THE COHORT

Diagram 32 shows the actual flow of pupils during the period. The major points to be noted are: (*a*) the pattern of promotion worsened slightly during the period, but presents a correct level; (*b*) repetition is very pronounced in all grades, but especially grade 5 where it is an increasing trend; (*c*) on the other hand, drop-out is only pronounced in the first grade, where it tends to decrease. In the other grades, where it is low, it is also decreasing.

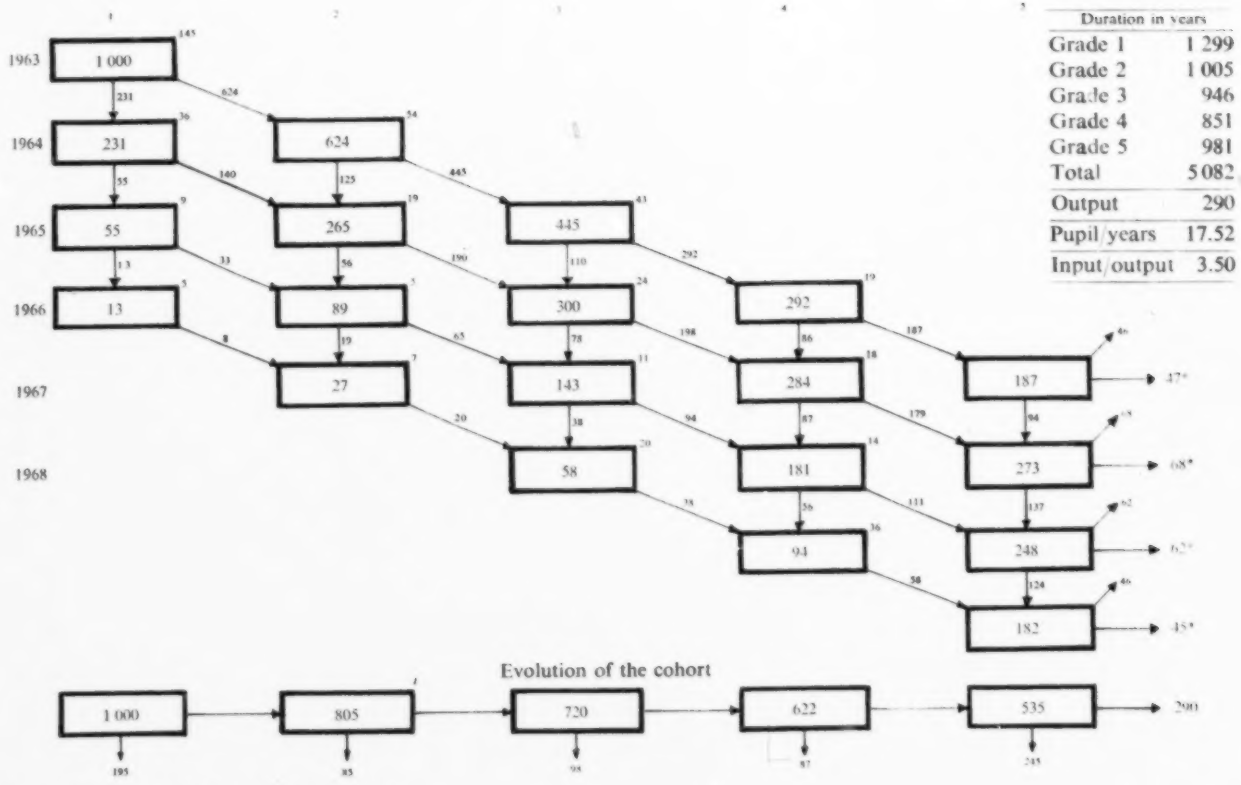
The cohort reconstructed by the successive application of the observed rate is established in Diagram 33.

Diagram 32. Morocco. Actual flow of pupils through first level of education, 1963/64 to 1969/70 (girls and boys)



* Reported as successfully passing the final examination

Diagram 33. Morocco. First level of education (girls and boys)



Duration in years	
Grade 1	1 299
Grade 2	1 005
Grade 3	946
Grade 4	851
Grade 5	981
Total	5 082
Output	290
Pupil/years	17.52
Input/output	3.50

* Reported as successfully passing the final examination

ANALYSIS OF EFFICIENCY

The main features of Moroccan internal efficiency at the first level of education are offered by the following indicators.

(i) *Input/output ratio:*	3.50
(ii) *Over-all drop-out:*	71.0%

It will be noted that only 29 per cent of the pupils who enter the cycle complete it successfully. There is also a 24.5 per cent drop-out in the last grade, the meaning of which should be carefully interpreted as an extreme hypothesis is being used that consists of considering as promoted only those who passed their examination successfully.

(iii) *Output by number of repeating years:*

Years repeated	Output	
	total	%
0	47	16.2
1	68	23.4
2	62	21.4
3	45	15.5
4	68	23.5
Total	290	100

The weight of repetition is evident from the following distribution.

(iv) *Promotion and drop-out profiles:*

Grades	Promotion (grade 1 = 1 000)	Drop-out
1	1 000	195
2	805	85
3	720	98
4	622	87
5	535	245
Total	290	710

These profiles confirm the observation concerning critical points of drop-out, as well as the transition sequence which follows.

(v) *Percentage of transition from grade to grade:*

Grades	Total
1	80.5
2	89.4
3	86.4
4	86.0
5	54.2

(vi) *Percentage of pupil/years spent in excess:*

Optimum pupil/years to be invested		
	total: 290 × 5	1 450
Total invested		5 082
Excess		3 632
Percentage of total invested		71.5

(vii) *Attribution of the pupil/years spent in excess*

Pupils/years spent in excess	3 632
attributable to:	
(*a*) graduates	599 (16.5)
(*b*) drop-outs	3 033 (83.5)

(viii) *Places absorbed by drop-outs, but effective (i.e. leading to promotion):*

Total = 1 522 years or 50.2% of the years attributable to drop-outs

CONCLUSION

Two main aspects of the Moroccan education system call for attention: (*a*) repetition in all grades, especially the last grade; (*b*) examination of the apparent drop-out in the last grade.